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ABSTRACT

Social sciences, science, and mathematics curriculum improvement projects supported by the National Science Foundation are described in this publication. Description of projects is limited to those having direct relevance to pre-college education and to those supported by the Materials and Instruction Development Section of the Division of Pre-College Education in Science. At the end of this booklet is a section describing some important conferences and research studies of general interest for the development of materials and instructional strategies, or for evaluation of specific projects. The present publication is organized first according to grade level--elementary, intermediate, and secondary--and then within educational level by broad discipline groupings--mathematics, science, and social sciences. The project descriptions reflect the state of activities as of January 31, 1974. Entries include name and address of the project director and of the current contact for the program, a brief summary of objectives and accomplishments, a discussion of activities, and a list of available materials and addresses for obtaining them. (DT)

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Course and Curriculum Improvement Projects

MATHEMATICS
SCIENCE
SOCIAL SCIENCES

ELEMENTARY
INTERMEDIATE
SECONDARY

NATIONAL
SCIENCE
FOUNDATION

SE 018 106

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C. 20550

July 8, 1974

PUBLICATION ANNOUNCEMENT

The National Science Foundation (NSF) has just issued a new edition of Course and Curriculum Improvement Projects (E-74-30), a 50-page booklet that describes major course and curriculum projects supported by NSF for elementary and secondary schools. The new edition updates and replaces the 1970 edition, and reflects the state of activities as of January 31, 1974.

The new booklet describes 87 course and curriculum projects in science, the social sciences, and mathematics for elementary, intermediate, and secondary schools. It is organized first according to grade level, and then within educational level by broad discipline groupings. The booklet also describes related pre-college projects dealing with conferences, studies, and research.

Many of the course improvement projects supported by NSF are major efforts, extending over a period of years. They involve scientists, technicians, craftsmen, artists, writers, teachers, and special consultants. Materials are usually placed in the hands of publishers and distributors in the private enterprise sector for wide-scale distribution.

Requests for further information on commercially available materials should be directed to the source cited. When a source of further information concerning the project is also cited, inquiries could be directed to that source, not to NSF.

Single copies of Course and Curriculum Improvement Projects (E-74-30) are available free upon request from Forms and Publications Unit, ASO, National Science Foundation, Washington, D.C. 20550. Multiple copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $1.20 each.

Course and Curriculum Improvement Projects

MATHEMATICS
SCIENCE
SOCIAL SCIENCES

- Curriculum Development
- Textbooks
- Laboratory Guides
- Resource Materials for Teachers
- Supplementary Materials for Students
- Equipment Development
- Films
- Educational Research

NATIONAL SCIENCE FOUNDATION
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INTRODUCTION

This publication describes the major course and curriculum projects supported, in whole or in part, by the National Science Foundation for elementary and secondary schools. It is further limited to those projects which were supported by the Foundation's Division of Pre-College Education in Science, through the Materials and Instruction Development Section of that Division. NSF has supported development of other materials useful for elementary and secondary school education even though the primary target for their original development was not pre-college education. These are not listed or described in the present publication, but in future editions they will be. At the end of this booklet is a section describing some important conferences and research studies of general interest for the development of materials and instructional strategies, or for evaluation of specific projects.

The present publication updates and replaces NSF 70-18 *Course and Curriculum Improvement Projects*. It is organized first according to grade level—elementary, intermediate and secondary—and then within educational level by broad discipline groupings—mathematics, science, and social sciences. Since the senior high school (grades 10-12) tends to emphasize specific disciplines, certain of the traditional disciplines are individually covered; however, as is the case for earlier grade levels, much of the material at that level is interdisciplinary.

Some of the course improvement projects supported by the National Science Foundation are major efforts, extending over a period of years. They may involve scientists, technicians, craftsmen, artists, writers, teachers, and special consultants in a wide variety of disciplines and skills. Before final completion of a project there are a number of stages which include but are not limited to rough draft, writing, small scale trial, revision, further trial, and final draft. Typically, such a course or curriculum project will generate texts, manuals, teacher guides, reference or other supplementary materials, examinations, films, tapes and records, or other media as products. Whenever practical, these materials are placed in the hands of publishers and distributors from the private enterprise sector for wide scale dissemination.

The project descriptions reflect the state of activities as of January 31, 1974. Where project materials are available commercially, the name and address of the publisher, distributor, or manufacturer is given in the description.

Within each subsection of this publication, project descriptions in general appear in reverse chronological order, with those most recently funded appearing first and those funded earliest appearing last, except where logical considerations dictate another ordering. Each project heading begins with the official project title, except when a project produced one textbook, one course, or a single definitive curriculum. In such a case, the title of the book, course, or curriculum precedes the official project title. Dates indicate the period in which a project operated under Foundation support; dates do not indicate any project activity that may have occurred prior to or following Foundation support. The project director address and that of the grantee institution follow, except, when appropriate, the project director address or identification of the grantee institution appears in parentheses. When someone other than the project director is the appropriate contact for a project, the current contact is listed separately below the project heading.

Requests for further information on commercially available materials should be directed to the source cited. When a source of further information concerning the project is also cited, inquiries should be directed to this source and not to the Foundation. It may be noted, however, that the results of many of the projects have been translated or adapted for use in foreign countries. A list of such materials or other information concerning translation or adaptation for foreign use can be obtained from the Foundation.

The National Science Foundation does not recommend the adoption of any specific book, film, piece of apparatus, course, or curriculum. Decisions on what to teach remain, in the healthy American tradition, the exclusive responsibility of individual schools and teachers. It is hoped, however, that the products of these projects will prove to merit serious consideration by all concerned with education at the pre-college level.

I. ELEMENTARY SCHOOL PROJECTS

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For additional projects related to this section see also:

20. Outdoor Biology Instructional Strategies (OBIS).
21. Human Sciences Program (HSP).
22. Environmental Studies for Urban Youth (ES).
32. Living Biology Film Series.
45. "Horizons of Science" Films.
65. Stanford Mathematics Education Study Group.
72. Seminar on the Diffusion of New Instructional Materials and Practices.
73. Social Science Education Consortium (SSEC).
74. Cambridge Conference on School Mathematics (CCSM).
75. AAAS Commission on Science Education (CSE).
76. School Mathematics Study Group (SMSG).
79. Conference on the Middle School Mathematics Program.
86. Center for Unified Science Education (FUSE).
87. Video Tape Project.

A. Mathematics

1. SCHOOL MATHEMATICS STUDY GROUP (SMSG). 1958-1972. **E. G. Begle**, School of Education, Stanford University, Stanford, California 94305. (Original grantee: Yale University, New Haven, Connecticut 06520. 1958-1961.)

Digest. The SMSG project produced a variety of materials including texts, tests, films, teacher guides, monographs, supplementary and/or enrichment materials, supplementary readings for students and teachers, and teacher training films. Some or all of these kinds of materials were produced for the elementary school level. For a full description of this project see number 76.

2. THE ARITHMETIC PROJECT. 1965-1970. **David A. Page**, Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160.

Current Contact. Jack Churchill.

Digest. The Arithmetic Project produced a package of in-service materials and activities specifically designed for use by local school systems in upgrading the understanding of content and the teaching of mathematics by groups of elementary school teachers. The course is designed to be directed by a local elementary school faculty member whose background is better than average. (This material may also be used in pre-service training of teachers.)

Discussion. The in-service course is made up of separate mathematical topics or problems—for example, "effects of using rules in different orders" and "maneuvers on lattices." No grade level is prescribed for consideration of any given topic, and the course is not adapted for any specific textbook series or course of study. The intent is that elementary school teachers who take the course will use its ideas and content to modify and enrich their mathematical instruction, regardless of grade or student ability level. It is expected that they should be enabled to devote a third or more of arithmetic class time to project-derived content and activities.

The course package includes written lessons for study by teachers between institute sessions, films showing mathematics being taught to classes of children by a variety of teachers, and supplementary materials providing further mathematical exposition and suggestions for the classroom. Discussion notes and detailed guides for correcting the written lessons are also included.

Materials Available. From Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160:

1. The course, as a package consisting of written materials for participants, discussion notes for workshop leaders, and rented films.
2. General information about the course, and sample materials.
3. A 24-hour telephone service for advice and consultation for course leaders, and consultant service to help set up the course.

Number Lines, Functions, and Fundamental Topics, by David A. Page, is published by The Macmillan Co., 866 Third Avenue, New York, New York 10022.

3. IN-SERVICE FILMS IN MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS. 1963-1966. **Harry D. Ruderman**, Hunter College High School, 930 Lexington Avenue, New York, New York 10020. (Grantee: National Council of Teachers of Mathematics (NCTM), 1906 Association Drive, Reston, Virginia 22091.)

Current Contact. James D. Gates, Executive Secretary, NCTM.

Digest. A series of ten 30-minute films was prepared for in-service training of teachers of elementary school mathematics.

Discussion. The film series treats the system of whole numbers, the operations in this system and the properties of these operations, our common decimal notation for whole numbers, and the usual algorithms. Each film is accompanied by text materials and there is a teacher manual for the entire series. The presentation is consistent with the recommendations of the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America.

Materials Available. The films (16 mm in color) are distributed by Universal Education and Visual Arts, 221 Park Avenue South, New York, New York 10003. The related text, *Mathematics for Elementary School Teachers*, is available from the NCTM.

4. MADISON MATHEMATICS PROJECT (MAD-M). 1961-1973. **Robert B. Davis.** Curriculum Laboratory, University of Illinois, 1210 West Springfield Avenue, Urbana, Illinois 61801. (Grantee: Webster College, St. Louis, Missouri 63119.)

Digest. The Madison Project was concerned with curriculum change in school mathematics, primarily in grades K-9, and with the relation of mathematics to other studies. Objectives included the study of cognitive growth in children and the study of effective learning environments. The project moved toward programs that are very different from those commonly in use. That portion of the project supported by NSF was primarily for the production of 16 mm films showing children in actual classrooms. The films and related printed materials are for use in the in-service training of teachers.

Discussion. The pedagogical approach (exploration and discovery learning) is shown by films of classroom scenes rather than by written guidelines or textbooks. The primary medium of recording data is 16 mm sound films, mostly black and white, unedited. Approximately 120 hours of film were produced. Ideas were developed as joint explorations with children, often working in small groups. Thus the films show intervention at the level of a child's actual mathematical experiences in school.

The subject emphasis is a combination of arithmetic, axiomatic algebra, coordinate geometry, elementary functions, logic, limit of a sequence, and certain portions of physics. For in-service teacher education workshops, packages of films, tapes, printed materials, and activities were designed to introduce teachers to the simpler parts of arithmetic, algebra, and analytic geometry, in a discovery approach like that used by the children.

Materials Available. The following project materials are available at Curriculum Laboratory, University of Illinois, 1210 West Springfield Avenue, Urbana, Illinois 61801:

In-Service Course I—A package of films and printed materials for teacher workshops.

In-Service Course II—A sequel to *In-Service Course I*.

Journal of Children's Mathematical Behavior. Vol. 1, No. 1. Contains a recent overall description of Madison Project activity. Vol. 1, No. 2. Contains analytical studies of children's mathematical thinking.

Assorted films (e.g., *A Lesson with Second Graders*; *Graphing a Parabola*; *Outdoor Mathematics*).

The following film series is available from Houghton Mifflin Company, 110 Tremont Street, Boston, Massachusetts 02107:

A Concrete Approach to Elementary Ideas in Mathematics. A series of 12 black and white 16 mm films (with sound) on arithmetic and an accompanying booklet of the same title.

The following printed materials are available from Addison-Wesley Publishing Company, Inc., Sand Hill Road, Menlo Park, California 94025:

Discovery in Mathematics (teacher text and student discussion guide). Provides a supplementary program in coordinate geometry and axiomatic algebra especially suitable for grades 4-8.

Exploration in Mathematics (teacher text and student discussion guide). Develops introductory ideas in algebra, statistics, logic, and some application to physics, and is especially suitable for students in the grade 6-9 range.

(See also number 67.)

5. EXPERIMENTAL TEACHING OF MATHEMATICS IN THE ELEMENTARY SCHOOL. 1959-1971. **Patrick Suppes.** Institute for Mathematical Studies in the Social Sciences, Stanford University, Stanford, California 94305.

Current Contact. Marguerite Shaw, Ventura Hall, Stanford University, Stanford, California 94305.

Digest. Materials for the implementation of computer-assisted instruction were produced in each of two areas of elementary mathematics. One area is concerned with a drill-and-practice supplementary curriculum for grades 1-6. The second is an extension and revision of the tutorial computer-based curriculum in logic and algebra aimed at more capable students in grades 4-8.

Discussion. The drill-and-practice supplementary curriculum is divided into 15 major concepts and skills, ranging from horizontal addition to the solving of elementary word problems. Initial grade placement in each of these 15 skill or concept strands is based on the student's abilities, and each student is moved through the structure according to his individual performance, without reference to the performance of other students. The criterion for moving from one grade-placement level to the next in each strand is set so that the average student should make one year's grade-placement progress in one academic year.

The extended and revised tutorial computer-based curriculum in logic and algebra is designed to carry capable students up to the level of covering, from an axiomatic standpoint, a good part of the algebraic content of a ninth-grade algebra course. The important aspect of this course is that the student constructs individual counterexamples, and these are checked recursively by the computer. Any valid proof within the rules given to the student is accepted by the computer program.

Materials Available. The following are available from the project: *Drill-and-Practice Mathematics, Grades 1-6, block structure*; *Drill-and-Practice Mathematics, Grades 1-6, strands structure*; *Logic and Algebra Curriculum, Grades 4-8*.

There are three kinds of materials available for each curriculum: a listing of the curriculum, a listing of the computer program for the curriculum, and magnetic tapes on which the foregoing are listed.

A memorandum provides specific costs and other details about the courses, references related research publications, and lists names and addresses of commercial sources for software services in computer-oriented instruction.

B. Mathematics and Science

6. UNIFIED SCIENCE AND MATHEMATICS FOR ELEMENTARY SCHOOLS (USMES). 1970-
Earle L. Lomon, Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160.

Current Contact. Christopher R. Hale or Betty M. Beck.

Digest. Since its inception in 1970, USMES has been developing and carrying out field trial implementations of a series of interdisciplinary units for use with elementary school students. The units, based on long range investigations of real problems that exist in the students' local communities, bring together content and processes that draw on science, mathematics, and social studies.

Discussion. The controlling goal of the project is to develop approximately 35 interdisciplinary units (mainly science, mathematics, and social studies) from which curriculum planners can make selections to create a flexible, integrated core curriculum for grades 1-8. It is not intended that the USMES units should provide a comprehensive curriculum in the usual sense of the term, but it is estimated that the complete set of units could replace as much as 50 percent of present teaching/learning activities in the three fields.

Twelve of these units have undergone implementation trials in 1973-74. Another 10 are in either the first or second year of their classroom development stage.

Each unit is presented to students as a long-range "challenge." For instance, the challenge in the case of a unit title "Traffic Flow" is "Recommend and try to have accepted a new road design or system for rerouting traffic so that cars and trucks can move safely and at reasonable speed through a busy intersection near your school."

The other 11 titles in the first dozen units are: Pedestrian Crossings, Lunch Lines, Burglar Alarms, Electromagnetic Device Design, Consumer Research-Product Testing, Soft Drink Design, Play Area Design and Use, Describing People, Designing for Human Proportions, Dice Design, and Weather Predictions.

All USMES materials are essentially resource instruments for student and/or teacher use. The challenges are adaptable for use with many different age groups and with students of different backgrounds and interests. Available materials include: (1) *USMES Guide*, a compilation of information for use in planning a curriculum based on USMES units; (2) *A Teacher's Resource Book* for each unit, containing specific unit ideas, documentation of class activities, and reference to other materials that could be used in connection with the unit; (3) *"How to" Cards*, to provide students with information about specific skills or processes they need; (4) *Technical Background Papers*, written to provide information for teacher use on problems that may arise in connection with various investigations; (5) *Teacher Logs* describing actual classroom experiences with a given unit, some of which are included in each *Resource Book*; and (6) and (7) *Design Lab Manual* and *Catalog of Design Lab Construction*.

The Design Lab as used with USMES units is a specialized work area in which students can design, construct, and test out apparatus needed for their researches, and is an essential resource if USMES objectives are to be realized. There are no prepackaged USMES apparatus kits and none is planned.

Materials Available. During their developmental stage, USMES materials are available only to the limited number of schools participating in developmental and closely associated field trial activities under close supervision by the project staff. However, beginning in the fall of 1973 inexpensive editions of certain of the more fully developed USMES trial materials became available for purchase by interested teachers or schools. For general information about the program and for information of available materials and prices, write to either of the staff contacts mentioned above.

7. ELEMENTARY SCHOOL MATHEMATICS AND SCIENCE PROJECT (UICSM). 1969-
Peter B. Shoresman, School of Education, University of Illinois, Urbana, Illinois 61801.

Digest. This project developed integrated mathematics/science materials for use in open classroom settings in grades K-6. The materials are intended primarily for teacher use.

Discussion. The materials developed by this project are intended for use by teachers working in any of a

variety of open classroom situations where mathematics and science can be related to each other as well as to other areas of the elementary curriculum. Materials consist of booklets, some of which contain student activity cards. Each booklet outlines a topic suitable for study by elementary school children. Examples of unit titles are: *Merging Science and Mathematics, Electricity and Reasoning,* and *Do You See What I See?*

Materials Available. About a dozen units are available in preliminary edition from the project. Information on plans for commercial publication can also be obtained from the project director.

(See also numbers 17, 18, and 19.)

8. MINNESOTA SCHOOL MATHEMATICS AND SCIENCE TEACHING PROJECT (MINNEMAST). 1961-1970. **James H. Werntz,** Jr., University of Minnesota, Minnesota School Mathematics and Science Center, 720 Washington Avenue, S.E., Minneapolis, Minnesota 55455.

Current Contact. Jean Dailey.

Digest. The MINNEMAST Project developed a coordinated curriculum in mathematics and science for grades K-3, as well as teacher preparation materials and teaching aids.

Discussion. Based on the premise that the elementary school curriculum should emphasize the interrelationship between science and mathematics, this project produced 39 sequential units that coordinate the teaching of mathematics with the teaching of science in kindergarten and the primary grades. These materials are aimed not only at preparing children in concepts, skills, and attitudes, but also at developing within children the ability to organize content and skills acquired from any of a variety of sources. Teacher manuals, student manuals, printed aids for students, and kits of materials are available for each of the units. In order to facilitate the transition to upper-elementary materials, the project prepared the publication, *MINNEMAST Recommendations for Science and Math in the Intermediate Grades.*

In conjunction with the project's concern and efforts to improve the preparation of prospective elementary teachers, Professor Avron Douglis wrote the text, *Ideas in Mathematics,* which provides a new approach to undergraduate mathematics instruction. Since several MINNEMAST Units involve living things, the project produced a teacher resource handbook, *Living Things in Field and Classroom.* In addition, a resource book of enrichment materials in science and mathematics history, *Adventures in Science and Mathematics* is available.

Materials Available. From W. B. Saunders Co., West Washington Square, Philadelphia, Pa. 19105: *Ideas in Mathematics.*

From *either* the MINNEMAST office *or* EduTech Products, Inc., 230 Canal St., Lawrence, Massachusetts 01840:

1) The MINNEMAST Coordinated Units,

2) teacher manuals,

3) kits of materials,

4) detailed information about these materials and a price list,

5) a free booklet, *Questions and Answers about MINNEMAST,*

6) a moderately-priced booklet, *Overview,* which provides a more comprehensive discussion of the curriculum,

7) *Living Things in Field and Classroom* (Teacher Handbook),

8) *Adventures in Science and Mathematics,* and

9) *MINNEMAST Recommendations for Math and Science in the Intermediate Grades* (Transition Document).

C. Science

9. CONCEPTUALLY ORIENTED PROGRAM IN ELEMENTARY SCIENCE (COPES). 1972-1973. **Morris H. Shamos.** Department of Physics, New York University, 4 Washington Place, New York, New York 10003.

Digest. COPES is a science program for students in grades K-6. The curriculum materials developed by the project consist, in the main, of teacher guides that provide understanding of the science involved and permit teachers to guide pupils through the student-oriented activities.

Discussion. COPES was funded by the Office of Education from its inception as a pilot program in 1965 through 1971, during which time the curriculum for grades K-6 was developed and teacher guides were completed for grades K-3. NSF has provided support for completion of the teacher guides for grades 4, 5 and 6.

The COPES program focuses on five major conceptual schemes for organizing the facts and theories in science: (1) the structural units of the universe, (2) interaction and change, (3) the conservation of energy, (4) the degradation of energy, and (5) the statistical view of nature.

This is an activity-centered curriculum that presents a number of highly sophisticated scientific ideas at a level readily understood by most elementary school students. Another significant feature of the program is that the required equipment and supplies can, in most instances, be purchased locally and at a cost of about a dollar per year per student.

The last of the teacher guides became available in the fall of 1973. Each guide presents the basis of a science program for a single elementary school grade, except that the first one covers both kindergarten and grade one. Student work sheets and assessment materials ready for photocopying accompany the guides. During the pilot phase of the project, a K-6 instructional sequence dealing with energy resulted in the production of a K-6 handbook entitled *Teacher's Guide for the Conservation of Energy*.

The project staff conducts workshops and other in-service activities for schools interested in or making use of COPES.

Materials Available. The materials described above can be purchased from the Center for Educational Research, 51 Press Building, New York University, 32 Washington Place, New York, New York 10003.

General information about the program and about in-service activities can be obtained from the project director.

10. ELEMENTARY SCIENCE STUDY (ESS). 1962-1973. **Joseph Griffith.** Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160.

Current Contact. Adeline Naiman.

Digest. The Elementary Science Study project developed 56 units for use in science programs from kindergarten through the 8th grade. Each unit is designed to be used over a range of grade levels, depending on the scope and depth of the approach. ESS units do not comprise an elementary school science curriculum. Rather, teachers may select from them to construct a course to meet local needs or to supplement existing courses. Their adaptability enables use in conventional or "open" classroom settings.

Discussion. It is the intent of Elementary Science Study units to put physical materials in the hands of students from the start and challenge them to investigate the nature of the physical world rather than to begin with discussions of basic scientific principles.

There is no ESS curriculum or course of study, and there is no stated or implied sequence in which units are to be employed. Instead, the units are a teaching/learning resource from which teachers may draw to prepare a science program best suited to local needs and interests. Their flexibility is enhanced by the fact that each unit can be adapted to several different grade levels.

Units vary in the amount of classroom time they must be allotted. Some are intended for regular class use over a comparatively short period of time, while others may require daily attention for several months. Some units can be worked on intermittently during a time when others are given regular and intensive attention.

The units have been used successfully with students possessing a wide range of educational backgrounds and academic abilities. They are adaptable to both self-contained classrooms and departmentalized teaching. They are ideal for "open" classrooms.

Each unit includes a teacher guide and manipulative materials for the students; some have student worksheets, photographs or films. Kits consisting of common and inexpensive materials are commercially available for each unit, though many of the pieces of apparatus can be purchased or assembled locally. In addition, the project has produced several resource books for ESS teachers.

Materials Available. The units—teacher guides, student materials, work kits, and films—are available from the Webster Division, McGraw-Hill Book Co., Hightstown, New Jersey 08520. Comments on each unit and a detailed listing of materials for a given unit are found in the publisher's *Science Materials Catalog*.

The following materials are available from the Education Development Center, Inc. (EDC), 55 Chapel Street, Newton, Massachusetts 02160:

A Materials Book for the ESS contains a complete listing of all materials needed for ESS units and suggests different ways of providing needed equipment.

A Working Guide to the ESS contains descriptions of all units, films, and books; information on scheduling, costs, and ways the units are being used; and evaluation possibilities.

The ESS Reader is a collection of reprinted selections from the literature that has accumulated about the ESS project.

The Elementary Science Study—A History is a documentary record of the life of the ESS project: people, events, critical issues and achievements.

Three booklets present interviews with teachers who discuss the ways they made use of ESS materials in their classrooms.

Eight ESS films are primarily for teacher use. Two of the most recent of these are "Pond Water," a 2-part film that shows a 6th grade class working with an ESS unit, and "Kitchen Physics," which follows another 6th grade group over a period of several weeks.

Further information about these ESS/EDC publications can be obtained from the contact listed above. Developments in the ESS program are reported in the *EDC News*. Requests to be placed on the mailing list for the *News* should be addressed to the EDC Publications Department.

11. SCIENCE CURRICULUM IMPROVEMENT STUDY (SCIS). 1962- . **Robert Karplus,** Lawrence Hall of Science, University of California, Berkeley, California 94720.

Digest. The SCIS project has developed ungraded, sequential physical and life science programs for the elementary school that are designed to turn the classroom into a laboratory.

Discussion. The SCIS programs consist of units originated as scientists' ideas for investigations that might challenge children and cultivate key scientific concepts. The ideas were adapted to the elementary school and the resulting units were used by teachers in regular classrooms. Each unit of these programs has been carefully evaluated by SCIS staff as it progressed from early exploratory stages to the published edition.

Central to these elementary school programs are current ideas of intellectual development. A child's elementary school years are a period of transition as he continues the exploration of the world and develops confidence in his own ideas. Extensive laboratory experiences at this time will enable him to relate scientific concepts to the real world in a meaningful way. As he matures, the continual interplay of interpretations and observations will frequently compel him to revise his ideas about his environment.

The instructional strategy is for children to explore selected science materials and phenomena. They are encouraged to investigate, to discuss what they observe, and to ask questions. The SCIS teacher has two functions: to be an observer who listens to children and notices how well they are progressing in their investigations, and to be a guide who leads the children to see the relationship of their findings to the key concepts of science. The SCIS program consists of six life science and six physical science units and includes a special unit devised for use in kindergarten.

Materials Available. The following units, which include teacher guides and student materials, are available from Rand McNally & Company, Customer Service Department, P. O. Box 7600, Chicago, Illinois 60680: *Material Objects, Organisms, Interactions and Systems, Life Cycles, Subsystems and Variables, Populations, Relative Position and Motion, Environments, Energy Sources, Communities, Models: Electric and Magnetic Interactions,* and *Ecosystems.* Sample guides and information about SCIS materials, and consultant services to school systems, are also available from Rand McNally.

The following are available from the project: (1) *Science for Kindergarten*, (2) *SCIS Teacher's Handbook*, an aid and reference for the teacher starting to use SCIS; (3) *SCIS Omnibus*, a compilation of pertinent SCIS publications, arranged in chronological order from 1962 to 1972; (4) *SCIS Evaluation Supplements*, a set of evaluation activities to be used by teachers in association with the SCIS units listed above; and (5) *SCIS Newsletter*, a newsletter providing current information about developments in the program published annually.

Fourteen films produced for use with the SCIS curriculum and with teacher training workshops may be rented from the Media Extension Center, 2232 Shattuck Avenue, Berkeley, California 94720. They are also available for purchase. Inquiries about cost and ordering information may be sent to the project.

For information about more recent reports, write to Dr. Herbert D. Thier at the address listed for the project.

12. **SCIENCE—A PROCESS APPROACH** (SAPA): COMMISSION ON SCIENCE EDUCATION. 1962-1971. **John R. Mayor,** American Association for the Advancement of Science, 1515 Massachusetts Avenue, N. W., Washington, D.C. 20005.

Digest. *Science—A Process Approach* is an elementary school science curriculum for use in kindergarten through grade 6. Topics covered in the exercises sample widely from the various fields of science. Mathematics topics are included, to be used when needed as preparation for other science activities. The program has a sequential pattern to provide a developmental progression of increasing competence in the processes of science.

Discussion. Instructional materials are contained in booklets written for and used by the teacher. Accompanying kits of materials are designed for use by teachers and children. Except for certain data sheets in the later grades, there are no printed materials addressed to the pupil. Each exercise is designed to achieve clearly stated objectives. These are phrased in terms of the kinds of pupil behavior that can be expected to result from completion of the exercise. Methods for evaluating pupil achievement are an integral part of the instructional program.

Revision of the course is in progress. Revision activities include adaptation for individualized instruction, additional exercises in the biological and social sciences, and increased attention to environmental considerations.

Materials Available. Available from Ginn and Company, Xerox Education Group Distribution Center, 555 Gotham Parkway, Carlstadt, New Jersey 07072:

(1) *Science—A Process Approach*, individual classroom units for kindergarten through grade six. Parts A through G include a Science Materials Kit and a Teacher Guide. The Teacher Guide may be purchased separately.

(2) Learning hierarchy charts for the basic and integrated processes.

(3) *Commentary for Teachers*, a self-study manual to assist teachers of *Science—A Process Approach*.

(4) *Guide for Inservice Instruction*, a manual describing materials and activities for inservice and preservice programs for elementary school teachers preparing to teach *Science—A Process Approach*.

(See also number 75.)

13. ELEMENTARY SCHOOL SCIENCE PROJECT (ESSP). 1960-1969. **J. Myron Atkin,** Department of Elementary Education, and **Stanley P. Wyatt, Jr.,** Department of Astronomy, University of Illinois, Urbana, Illinois 61801.

Current Contact. Harper and Row, Publishers, Inc., Elementary and High School Division, 2500 Crawford Avenue, Evanston, Illinois 60201.

Digest. The project staff, made up of professional astronomers, science education specialists, and classroom teachers, identified and developed certain major conceptual themes in astronomy appropriate for upper elementary and junior high school students. Materials were revised on the basis of findings from extensive field tests and other evaluation activities. The final product is a series of six books, each accompanied by a teacher guide.

Materials Available. All books in the series can be ordered from the publishers at the address given above. The books and their authors are:

Charting the Universe (H. Alvers)

The Universe in Motion (S. P. Wyatt, Jr.)

Gravitation (S. P. Wyatt, Jr.)

The Message of Starlight (B.F. Peery)

The Life Story of a Star (K. Kaufmanis)

Galaxies and the Universe (G. Reaves)

Information about Portuguese editions of some of the books is available from Instituto Brasileiro de Educacao, Ciencia e Cultura, UNESCO, Sao Paulo, Brazil.

(See also number 28.)

D. Social Sciences

14. ELEMENTARY SCHOOL POLITICAL SCIENCE EDUCATION PROJECT. 1972- **Richard C. Snyder,** Mershon Center, Ohio State University, Columbus, Ohio 43210. (Grantee: American Political Science Association, 1527 New Hampshire Avenue, N. W., Washington, D.C. 20036.)

Digest. A study has been made of the political science education in elementary schools. On the basis of this study, guidelines have been developed for the future development of instructional materials for grades kindergarten through six.

Discussion. Initial activities have been concerned with gathering and interpreting information about the political world and related educational activities of elementary school children. Guidelines, consisting of a rationale and criteria for selecting among possible alternative directions for developing new instructional materials, are being revised.

Materials Available. Further information is available from the project director.

(See also number 56.)

15. **MAN: A COURSE OF STUDY** (MACOS). 1963-1970. **Peter B. Dow,** Education Development Center, Inc., 15 Mifflin Place, Cambridge, Massachusetts 02138. (Grantee: Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160.)

Digest. *Man: A Course of Study* is a program for upper elementary and middle school students and is based on three questions framed by Jerome S. Bruner, its principal developer: "What is human about human beings? How did they get that way? How can they be made more so?"

Course materials rely heavily on research sources and present subject matter through a variety of media, including films, filmstrips, records, posters, and booklets.

Discussion. The first half of the course concentrates on the life cycles and behaviors of salmon, herring gulls, and baboons. These studies lead students to question the significance of generational overlap and parental care, innate and learned behavior, group structure and communication, and their relevance to the varying life styles of animal species, including the human species. The second half of the course is an intensive study of man in society. The Netsilik Eskimos of the Canadian Arctic are studied in depth, because their society is small and technologically simple, yet universal in the problems it faces.

Filmed material now available on modern lives of Eskimo families that appeared earlier in the course is being used to prepare a new film that will help students relate the Netsilik experience more directly to their own lives. The project will also develop new reading materials and lesson plans to accompany the film.

Materials Available. MACOS is available from Curriculum Development Associates, Inc., 1211 Connecticut Avenue, N. W., Washington, D.C. 20036.

(See also numbers 70 and 78.)

II. INTERMEDIATE SCHOOL PROJECTS

For additional projects related to this section see also:

4. Madison Mathematics Project (MAD-M).
5. Experimental Teaching of Mathematics in the Elementary School.
8. Unified Science and Mathematics for Elementary Schools (USMES).
10. Elementary Science Study (ESS).
13. Elementary School Science Project (ESSP).
14. Elmentary School Political Science Education Project.
29. Biological Sciences Curriculum Study (BSCS).
31. Ecological Film Project.
32. Living Biology Film Series.
37. Motion Pictures in Meteorology.
45. "Horizons of Science" Films.
65. Stanford Mathematics Education Study Group.
72. Seminar on the Diffusion of New Instructional Materials and Practices.
73. Social Science Education Consortium (SSEC).
74. Cambridge Conference on School Mathematics (CCSM).
76. School Mathematics Study Group (SMSG).
77. Conference on Piaget-Type Research.
81. Conference on the K-12 Mathematics Curriculum.
82. A National Conference to Consider the Role in High School of Interdisciplinary Learning Through Investigation and Action on Real Problems.
86. Center for Unified Science Education (FUSE).
87. Video Tape Project.

A. Mathematics

16. SCHOOL MATHEMATICS STUDY GROUP (SMSG). 1958-1972. **E. G. Begle**, School of Education, Stanford University, Stanford, California 94305. (Original grantee: Yale University, New Haven, Connecticut 06520. 1958-1961.)

Digest. The SMSG project produced a variety of materials including texts, tests, films, teacher guides, monographs, supplementary and/or enrichment materials, supplementary readings for students and teachers, and teacher training films. Some or all of these kinds of materials were produced for the intermediate school level. For a full description of this project see number 7o.

17. UNIVERSITY OF ILLINOIS COMMITTEE ON SCHOOL MATHEMATICS (UICSM). 1962-1971. **Russell E. Zwoyer**, University of Illinois Curriculum Laboratory, 1210 West Springfield, Urbana, Illinois 61801.

Digest. UICSM began its activities in 1951 when it initiated studies of the content and teaching of college-preparatory mathematics in grades 9-12, and support for the Committee's work during its first decade was provided largely by the Carnegie Corporation. NSF funding, which began in 1962, enabled UICSM to enlarge its range of interests to include development of a two-year program for underachieving junior high school pupils, a two-year vector

geometry course for senior high school use, and a film series for training teachers of first-year algebra (see number 18). In addition, an applied ninth grade mathematics course is being developed (described in detail in number 19).

Discussion. The two-year junior high school course is intended for young people in grades 7 and 8 whose records indicate underachievement, especially those whose underachievement appears to result primarily from cultural handicaps. Among the topics included are a detailed study of rational numbers expressed as common fractions, decimal fractions and percents, and an intuitive approach to geometry through translations, rotations, and reflections in space. Materials developed include texts, teacher guides, and visual aids. In the design of the two texts, *Stretchers and Shrinkers* and *Motion Geometry*, special attention was given to the physical appearance of the books—four-color printing, for instance—and the required reading skills were minimized.

The new senior high school program is a two-year sequence in vector geometry, most appropriately offered in grades 10 and 11 or 11 and 12. The course introduces translations (vectors) as mappings of Euclidean three-space on itself. It also takes up such topics as vector spaces, an introduction to groups, concepts of linear dependence and independence, and some of the traditional geometrical theorems.

UICSM is active in a variety of teacher orientation programs to prepare teachers to use its materials. Information about these programs can be obtained from the project director.

Materials Available. Text materials for the first project (1951-1962), which developed high school college preparatory courses, are published by D. C. Heath and Company, 285 Columbus Avenue, Boston, Massachusetts 02116. These materials include:

High School Mathematics, Courses 1, 2, 3, and 4 (student and teachers editions)

Introduction to Algebra

Materials for the 7th and 8th grade course (*Stretchers and Shrinkers* and *Motion Geometry*) are available from Harper and Row, Publishers, Inc., 2500 Crawford Avenue, Evanston, Illinois 60201.

The vector geometry course materials can be obtained from The Macmillan Company, 866 Third Avenue, New York, New York, 10022. The teacher training films are available for rental or purchase from Modern Learning Aids, 1212 Avenue of the Americas, New York, New York 10036. (Number 18 contains a description of these films.) Information on materials for the applied ninth grade course is available from the project during the development period.

(See also numbers 7, 18 and 19.)

18. FILMS FOR TRAINING NINTH GRADE ALGEBRA TEACHERS. 1962-1967. **Max Beberman** (deceased), University of Illinois Committee on School Mathematics, 1210 West Springfield, Urbana, Ill. 61801.

Current Contact. Russell E. Zwoyer, University of Illinois Curriculum Laboratory, 1210 West Springfield, Urbana, Illinois 61801.

Digest. UICSM, under the direction of Professor Beberman, prepared a series of films to acquaint teachers with the content of modern secondary school algebra courses and to exemplify pedagogical techniques proven effective with such content.

Discussion. The films are designed for flexible use in pre-service, in-service, or institute training, such that users may employ either the whole series or selected sub-series. Extensive written materials accompany the films. They include the following sub-series:

1. Fourteen films which trace the developments of concepts and principles that lead to an understanding of equations. This sub-series is appropriate for a three-week institute or workshop.
2. Ten films on operations with real numbers appropriate for a concentrated two-week workshop or for an in-service seminar meeting once each week.
3. Sixteen films on deductive justifications for algebraic manipulation, a topic common to all the new mathematics programs. Such a series is useful for a one-month institute or for a one-semester pre-service course for teachers.
4. Ten films on inequality relations in elementary algebra.
5. Ten films pertaining to the relation of algebra to its applications.
6. Three films on pedagogy.

Materials Available. The films are available for purchase or rental, individually or as a series, from Modern Learning Aids, Inc., 1212 Avenue of the Americas, New York, N.Y. 10036.

(See also numbers 7, 17 and 19.)

19. NINTH GRADE MATHEMATICS COURSE. 1969- . **Russell E. Zwoyer,** University of Illinois Curriculum Laboratory, 1210 West Springfield, Urbana, Illinois 61801.

Digest. Development of an applied ninth grade mathematics course was motivated by a growing awareness of need for a status course that would be an alternative to conventional ninth grade algebra courses and conventional general mathematics courses. Field testing of materials for the new course was initiated in the 1973-74 school year. Following refinement it is expected that the materials will be made available through commercial channels.

Discussion. The primary objective of this curriculum development project is to create a mathematics course that may be readily modified to meet differing needs of a wide range of students, and that will be attractive and useful to students who expect to discontinue the study of mathematics after their first year in high school. The course will encompass other areas in which the students are involved—social studies, general science, industrial arts, career courses, etc.

Since it is intended that the exact content of the course be adjusted to the needs and interests of each student group with which it is to be used, much more material is being prepared than would normally be included in a one-year course. Advisory materials are also being prepared to assist teachers in choosing from among topics available those that seem most appropriate to any given class.

Teaching techniques are also being developed to aid teachers in efforts to motivate students whose attitudes toward mathematics have been negative or indifferent.

The units that make up the course fall into three categories: *Coordinates and Functions, Probability and Statistics,* and *Mensurational Geometry,* with the first of these making up most of the course.

Materials Available. Until such time as the materials become commercially available, information about the course can be obtained from the project director.

(See also numbers 7, 17, and 18.)

B. Science

20. OUTDOOR BIOLOGY INSTRUCTIONAL STRATEGIES (OBIS). 1972- **Watson M. Laetsch,** Lawrence Hall of Science, University of California, Berkeley, California 94720.

Digest. OBIS is developing model units for teaching outdoor biology to young people in the 11 to 15 year-old range. While the materials being prepared will be useful in school programs, they are intended primarily for use in many kinds of youth programs outside the school.

Discussion. OBIS is creating units in outdoor biology that will enable students in their early teens to observe and experiment with those features of their immediate environment they will encounter most frequently in the normal course of their lives. The OBIS program differs from others in its field in two significant respects: (a) the units deal with man-managed and easily accessible locations such as lawns and reservoirs, and (b) materials and processes are designed so units can be used not only by school personnel but also by leaders of many kinds of community youth groups such as scout troops, 4-H Club groups, community recreation programs, and camps.

The first units developed and tested were those on *The Pond* and *The Lawn.* Other projected units will deal with the soil, the woodland, the estuary, the beach, and the school camp. The model units are being designed to allow an individual with little or no background in the natural sciences to help groups of young people observe ecological interactions and relationships.

The project will develop procedures for training leaders who will adapt the model units for use in their own communities. Equipment needed for most activities will be simple and inexpensive.

Materials Available. OBIS distributes a newsletter which provides details about the project, information about its progress, and the applicability of OBIS materials to various nonschool groups. Requests to receive the newsletter or other specific information about the project should be sent to the project director.

21. HUMAN SCIENCES PROGRAM (HSP). 1971- **William V. Mayer,** Biological Sciences Curriculum Study Company, Box 930, Boulder, Colorado 80302. 1971-1972. (Prior grantee: University of Colorado, Boulder, Colorado 80302. 1971-1972.)

Current Contact. James T. Robinson.

Digest. The Human Sciences Program (HSP) is developing a new multidisciplinary curriculum for use in the 6th, 7th, and 8th grades. Curriculum objectives were framed to take into account the needs of adolescents, and outlines of the content resulted from study of the interests and developmental characteristics of eleven to thirteen year-old adolescents. Subject matter is drawn from the biological, social, and behavioral sciences. Pilot testing of course modules began in 1972-73.

Discussion. HSP is creating a curriculum based on theoretical grounds that differ from those of existing science programs; the new curriculum is not designed to update the content of selected sciences, nor to increase the efficiency of learning the subject matter of a particular science. The newly devised theoretical base and the project's ultimate alternative to subject matter organization were derived from a large collection of student questions and concerns that the project developed by discussions with early adolescents, psychologists, and teachers, and a review of the literature. These questions were reduced to a small, stable structure by devising the concept of "generic questions." The concept of generic questions as one kind of curriculum organizer will be tested during the development of modules for grades six, seven, and eight. The four generic questions that seem to subsume the great majority of student questions and concerns are: (1) Why do things change?, (2) Why do living things act as they do?, (3) What determines who gets what?, and (4) What is normal?

The natural and social-behavioral sciences are the primary sources from which the curriculum is being drawn. Other areas of human knowledge are included as needed. Three themes employed as devices to restrict and guide the selection of various disciplinary elements are: (1) Continuity and Change, (2) Competition, Accommodation and Cooperation, and (3) Equality and Inequality.

A series of five or six modules for each grade is planned. The modules are identified by questions commonly voiced by adolescents—for example, "How are organisms alike? Different?" Most of the modules planned for a given grade level do not have a built-in sequence; some, however, will have special seasonal relevance. The module "package" will take the place of the usual texts, workbooks, laboratory guides, and other supplementary materials, for both students and teachers. Modules, on the average, will require from five to seven weeks of instruction, assuming a four- or five-hour class week devoted to the module.

Three experimental modules were tested, and preparation of 6th grade modules was initiated during 1972-73. The pilot modules are entitled, *Humansel?* (an inquiry into human similarities and differences), *Developing* (measuring, describing, thinking about growth and development in a variety of organisms), and *Learning* (activities in which students apply themselves to the description and/or solution of problems related to learning). Each module proposes several questions that call for student inquiry. Examples are "Can a fish learn?" and "What do you think of that?" The latter is an activity in which students find out how different groups of people feel about some familiar things. Several levels of investigation are possible in the suggested activities, which are non-sequential, so students can choose their topics and have some flexibility in scheduling their study.

Materials Available. The present schedule for the development-test-revision cycle is expected to place the 6th grade modules on the market for use beginning in September 1975, and those for the other two grades in the two succeeding years. A 72-page booklet, *HUMAN SCIENCES: A Developmental Approach to Adolescent Education*, discusses the general design of the curriculum and provides extensive illustrative documentation. The BSCS Newsletter (see number 29) provides information regularly about HSP, and its Number 53 describes *Behavior*, a demonstration module now available for use by schools. All of these materials are available from the project office at the address given above.

(See also numbers 15, 29, 30, 55, and 57.)

22. ENVIRONMENTAL STUDIES FOR URBAN YOUTH (ES). 1970- **Richard R. Sluss,** The Evergreen State College, Olympia, Washington 98505. (Prior grantee: American Geological Institute, 2201 M Street, N.W., Washington, D.C. 20037.)

Current Contact. Robert E. Samples, The Evergreen State College.

Digest. Environmental Studies was originally conceived as a project to help inner city junior high school students explore the environment they live in and to use this environment as a place where they can develop a strongly positive self image. ES materials are now being used for supplementary activities from kindergarten through grade 12 to help create a classroom environment where students and their teachers can develop a good relationship that helps them to use standard curriculum materials more effectively.

Discussion. To help teachers create the kind of setting for learning where the development of personal values is encouraged and where cognitive growth can take place under favorable conditions, the ES staff has developed six packets of environmental studies assignment cards. Each assignment card makes an ambiguous proposal to the student to go out into the environment—the school, neighborhood, home, etc.—and actively explore some element of that environment. Assignments include such tasks as, "Go outside and photograph evidence of change," "Go outside and take a picture of power," "Go outside and map something that you cannot see." This kind of ambiguity requires the student to define his own assignment and to provide his own measures of accomplishment. ES materials have been used not only with students in elementary and secondary schools, but also with college students in both general and teacher education programs. Teacher "non-guides" entitled *ESSENCE—ES SENSE* give suggestions for implementing a learning environment based on an approach to the affective domain.

Materials Available. The packets, a *Newsletter*, and further information are available from the project.

(See also numbers 36 and 41, and page 25.)

23. PROBING THE NATURAL WORLD: INTERMEDIATE SCIENCE CURRICULUM STUDY (ISCS) 1969-)

David Redfield and **William R. Snyder**, Florida State University, Tallahassee, Florida 32306.

Current Contact. Adrian Lovell, 415 North Monroe Street, Tallahassee, Florida 32301.

Digest. The ISCS project has produced a coordinated science sequence for grades 7, 8, and 9. A complementary teacher-preparation program, similar in style and format to the student materials, is also available.

Discussion. An exemplary feature of the ISCS materials is the fact that they permit the pace and level of instruction to be adjusted to the interests, ability, and background of the individual student. Built into the materials is the instructional point of view that the student should for the most part work independently and at his own pace, with the teacher serving primarily in an advisory role—giving clues, answering questions, correcting misconceptions, and extending concepts to new situations.

The materials for each course are divided into 1) a core sequence that every student follows and 2) special "excursion" activities that provide either enrichment for the more capable student or remedial help for the student with specific background deficiencies.

The content for the seventh-grade course is organized around the themes of "Energy, Its Forms and Characteristics" and "Measurement and Operational Definition." The themes for the eighth grade are "Matter and Its Composition" and "Model Building."

The ninth-grade course is designed to synthesize and extend the investigative experience and knowledge gathered up to that point and to apply them to problems of practical and scientific significance. The course is composed of a series of discrete investigations, each designed to occupy the student for six to eight weeks.

Ninth-grade text materials are available as eight separately bound softcover units. (Six units constitute enough material for a normal school year's work; eight units provide a choice of subject matter.) Each unit permits maximum use of the local situation from the geology and weather of the area to human variations and specific aspects of pollution. Problem breaks, occurring randomly throughout the ninth-grade materials, also rely on what is available locally.

In order to facilitate implementation of the ISCS program, the project has developed the Individual Teacher Preparation (ITP) program, designed for use in in-service settings at the local school level. The program is composed of individualized modules having a style and format similar to that of the ISCS student materials. The modules attend to two general areas of teacher needs—teaching strategies and understanding science content.

In association with the Individual Teacher Preparation modules on evaluating and reporting students' progress, objective testing materials based on project performance objectives have been prepared. These testing materials, especially designed for an individualized setting, are intended to help the teacher in his efforts to optimize individualization of the students' program. They should also significantly improve the teacher's ability to communicate the results of his evaluation of students to other teachers, administrators, and parents.

Materials Available. The ISCS course materials and equipment, and the ITP modules, are distributed by Silver Burdett. Requests for information and orders should be directed to: Product Manager, ISCS, Silver Burdett, Morristown, New Jersey 07960.

Available from project headquarters, on a loan basis, is a fifteen-minute 16 mm film that illustrates the aims and objectives of ISCS and, at no charge, a semiannual newsletter, an ISCS brochure, and periodic booklets describing the program and ongoing activities.

24. **INTRODUCTORY PHYSICAL SCIENCE** (IPS). 1963-1969. **Uri Haber-Schaim,** Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160.

Current Contact. Uri Haber-Schaim, Director of Physical Science Group, Department of Science and Mathematics Education, School of Education, Boston University, Boston, Massachusetts 02215.

Digest. IPS is a one-year course in physical science designed for use at the junior high school level.

Discussion. This first course, which is suitable for use with students of different ability levels, provides a beginning knowledge of physical science and offers insight into ways by which scientific knowledge is acquired. The major emphasis of the course is on the study of matter and development of an atomic model.

Laboratory experiments, which are an integral part of the course, are included in the body of the textbook. The recommended equipment has been planned so it can be used in a regular classroom on flat-top classroom tables.

Materials Available. The IPS textbook, *Introductory Physical Science*, and accompanying Teachers Guide, Notebook, and Achievement Tests, are published by Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. Requests for information about these materials should be addressed to the publisher.

Approved equipment is distributed by Prentice-Hall, Inc. (Damon Engineering), Englewood Cliffs, N.J. 07632, and by Hubbard Scientific Co., Box 105, Northbrook, Illinois 60062.

The 16 mm films with sound suggested for use as a part of the course are available from Modern Learning Aids, 1212 Avenue of the Americas, New York, N.Y. 10036. A set of seven super-8 film loops can be purchased from Prentice-Hall, Inc.

A newsletter is published cooperatively by the Physical Science Group and the publisher. Workshop programs are also jointly sponsored. Requests for copies of the newsletter and for information about workshops should be addressed to Uri Haber-Schaim at the Boston University address above.

(See also number 25.)

25. **PHYSICAL SCIENCE II** (PS II). 1967-1972. **Uri Haber-Schaim,** Newton College, 885 Centre Street, Newton, Massachusetts 02159. (Original grantee: Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160. 1967-1971.)

Current Contact. Uri Haber-Schaim, Director of Physical Science Group, Department of Science and Mathematics Education, School of Education, Boston University, Boston, Massachusetts 02215.

Digest. *Physical Science II* is a continuation of *Introductory Physical Science* (IPS) (see number 24.) and is intended primarily as a terminal physical science course for students, though it can also serve as preparation for more specialized science courses.

Discussion. Two broad topics provide the base for PS II: (1) the connection between atoms and electric charge, and (2) the various forms and changes in energy culminating in the law of the conservation of energy. The instructional style of PS II is similar to that of IPS in which emphasis is placed on group effort and on the collection and pooling of data.

The teacher guide for the course suggests various ways for evaluating student progress, and two series of achievement tests along with a testing manual are available. A special feature of these tests plays down the importance of data memorization by providing that the tests be taken with "open book" and "open notes."

Materials Available. The textbook (*Physical Science II*), teacher guide, achievement tests, and notebook are published by Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. Requests for information about these materials should be addressed to the publisher.

Approved equipment for PS II is distributed by Prentice-Hall, Inc. (Damon Engineering), Englewood Cliffs, N. J. 07632, and by Hickok Science, Wheeling Avenue, Woburn, Massachusetts 01801.

A program of local workshops is sponsored cooperatively by the publisher and the Physical Science Group to provide in-service training for teachers who expect to be responsible for PS II classes. For information about the workshop program and about the complete program in physical science, write to Uri Haber-Schaim at the Boston University address above.

26. **TIME, SPACE, AND MATTER:** SECONDARY SCHOOL SCIENCE PROJECT (TSM). 1963-1972. **George J. Pallrand,** Science Education Center, Rutgers, The State University, New Brunswick, New Jersey 08903. (Original grantee: Princeton University, Princeton, New Jersey 08540. 1963-1967.)

Digest. *Time, Space, and Matter—Investigating the Physical World*, an interdisciplinary science course developed by the project, is designed for use at the

junior high school level. In the nine major units of the course the student is placed in the role of "principal investigator" and the teacher acts as a guide and an active collaborator in search of understanding.

Discussion. The interrelated, sequential investigations that make up the course center on the basic nature and evolution of the earth-moon-sun system. In this firsthand experience with the investigative nature of science the student is using laboratory equipment, asking questions, solving problems of interest, recording his observations, and deriving interpretations which he also records and refines as necessary on the basis of newer observations and information. Topics of the nine investigations are: *Encountering the Physical World, Exploring a Slice of Earth, From Microcosm to Macrocosm, Levels of Approximation, Dimensions and the Motions of the Earth, The Surface of the Earth, The Grand Canyon of the Colorado, The Surface of the Moon, and Worlds in Space.*

Materials Available. The following materials are available from the Webster Division, McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, N. Y. 10020:

A Conspectus, giving an overview of the entire course.

Student Record Book, in which a student, during the course, can keep a journal of activities, observations, and conclusions.

Student Investigation Books, one for each of the nine topics, providing the student with relevant data not otherwise readily available.

Teacher Folios, one for each investigation, in the nature of teacher guides.

A 22-volume paperback *Science Reading Series*, providing a source of background information. Examples of titles in this series: *A Strange Crater in Arizona, When the Earth Trembles*, and *No Beginning, No End.*

Equipment and supplies for student use.

27. **INVESTIGATING THE EARTH:** EARTH SCIENCE CURRICULUM PROJECT (ESCP), 1963-1973. **William D. Romey**, P. O. Box 1559, Boulder, Colorado 80302. (Grantee: American Geological Institute, 2201 M Street, N. W., Washington, D.C. 20037.)

Current Contact. William Matthews, P. O. Box 10031, Lamar University Station, Beaumont, Texas 77710.

Digest. ESCP developed *Investigating the Earth*, an interdisciplinary earth science course for use with students in the 7 to 10 grade range.

Discussion. The course materials for *Investigating the Earth* are experience-centered, with emphasis on student inquiry. Laboratory exercises are an integral part of the textbook. These exercises require students to spend a large part of their time designing, performing, and interpreting investigations. Very few detailed instructions are provided so that students and teachers will be free to do some creative thinking. To supplement the text, there are 10 single-topic field study guides, among them, *Field Guide to Soils* and *Field Guide to Lakes*. A reference series was also developed on such topics as "Selected References on Earth Science Courses" and "Topographic Maps and How to Use Them." Six films are also available.

Materials Available. *Investigating the Earth*, the teacher guide, and the field study guides are published by Houghton Mifflin Company, 110 Tremont Street, Boston, Massachusetts 02107.

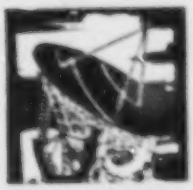
The reference series is available from the American Geological Institute, 2201 M Street, N. W., Washington, D. C. 20037.

Five films: *Toward Inquiry, How Solid is Rock?, Reflections on Time, Controversy Over the Moon*, and *The Ways of Water*, are available from Encyclopaedia Britannica Educational Corporation, 425 North Michigan Avenue, Chicago, Illinois 60611. A sixth film, *Men at Bay*, is available from King Screen Corporation, 320 Aurora Avenue North, Seattle, Washington 98109.

III. SECONDARY SCHOOL PROJECTS

For additional projects related to this section see also:

17. University of Illinois Committee on School Mathematics (UICSM).
20. Outdoor Biology Instructional Strategies (OBIS).
21. Human Sciences Program (HSP).
22. Environmental Studies for Urban Youth (ES).
24. INTRODUCTORY PHYSICAL SCIENCE (IPS).
25. PHYSICAL SCIENCE II (PS II).
27. INVESTIGATING THE EARTH—Earth Science Curriculum Project (ESCP).
72. Seminar on the Diffusion of New Instructional Materials and Practices.
73. Social Science Education Consortium (SSEC).
74. Cambridge Conference on School Mathematics (CCSM).
75. AAAS Commission on Science Education (CSE).
78. School Mathematics Study Group (SMSG).
81. Conference on the K-12 Mathematics Curriculum.
86. Center for Unified Science Education (FUSE).
87. Video Tape Project.



A. Astronomy

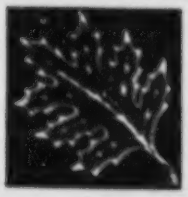
28. ASTRONOMICAL MOTION PICTURES FOR SECONDARY SCHOOLS AND COLLEGES. 1964-1968. **Paul M. Routly.** American Astronomical Society, 211 Fitz-Randolph Road, Princeton, New Jersey 08540.

Current Contact. H. M. Gurin.

Digest. Two 30-minute films on topics in astronomy were produced for use in secondary schools and colleges. In each, a leading scholar describes his own research and relates it to the broader range of investigations in modern astronomy and astrophysics. The films are primarily intended to help raise standards of teaching in secondary and undergraduate astronomy classes. They are: (1) *A Radio View of the Universe* (Morton S. Roberts, National Radio Observatory), and (2) *Exploring the Milky Way* (George W. Preston, Lick Observatory).

Materials Available. The films can be rented or purchased from Modern Learning Aids, 1212 Avenue of the Americas, New York, New York 10036.

(See also number 13.)



B. Biology

29. BIOLOGICAL SCIENCES CURRICULUM STUDY (BSCS). 1959-1971. **William V. Mayer,** Biological Sciences Curriculum Study Company, P. O. Box 930, Boulder, Colorado 80302. (Original grantees: American Institute of Biological Sciences, 3900 Wisconsin Avenue, N. W., Washington, D.C. 20016. 1959-1962; University of Colorado, Boulder, Colorado 80302. 1962-1971.)

Digest. The BSCS was established for the improvement of biological education at all levels. It first concentrated on programs for secondary school biology, including texts, laboratory materials, programmed materials, research problems, films, and slides for students of diverse abilities from below average to gifted in grades 10-12, as well as materials for teachers and administrators. Stress was placed upon teaching major principles of biology in depth with special emphasis on investigative laboratory work and the teaching of science as inquiry.

Discussion. Three versions of a modern high school course in biology were made available for use in the tenth grade. Although approximately 70 percent of the content is common to all three versions, each approaches the study of biology from a distinctive point of view. *Biological Science: Molecules to Man* (Blue Version) uses a molecular-biochemical-evolutionary approach; *High School Biology: BSCS Green Version*, an ecological-evolutionary approach; *Biological Science: An Inquiry Into Life* (Yellow Version), a cellular-biochemical-evolutionary approach. These three courses are equivalent in depth of content and design for students of average and above-average ability. Each version includes a text, laboratory materials, teacher manual, quarterly tests and a comprehensive final examination.

BSCS laboratory blocks provide six-week programs of concentrated investigation suitable for regular classes, and cover a wide range of areas, including development, ecology, behavior, genetics, and metabolism. A book describing many items of home-made, relatively inexpensive equipment and simplified laboratory techniques was also produced.

A special resource for teachers, *Biology Teachers' Handbook*, discusses the aims, philosophy, and methods of BSCS, and presents a set of Invitations to Enquiry—prepared discussions on selected biological problems designed to bring out aspects of scientific methods and philosophy.

For academically unsuccessful students the BSCS prepared a set of materials under the title of *Biological Science: Patterns and Processes*. These materials have been successful with students who had difficulties with regular classroom materials. This program includes a sequence of varied student materials and a comprehensive teacher edition.

For very capable students the BSCS published a series of four volumes containing a total of 160 selected investigations they might wish to undertake.

The Biological Sciences Curriculum Study also prepared a second course in biology, *Biological Science: Interaction of Experiments and Ideas*, emphasizing experimentation and the processes of science. This volume is a nonrepetitive work, depending on the student's prior knowledge of biology but not recapitulating it. It consists of a text and a detailed teacher edition.

Other aids for students include a series of programmed materials on such topics as population genetics, DNA, human reproduction, and energy relationships; a series of pamphlets on special topics in biology; a sequence of inquiry slides that can be projected in daylight upon a blackboard where the image may be marked upon by student or teacher in carrying through the inquiry; and a series of 40 *Single Topic Inquiry Films* that serve as data sources when investigating specific biological problems.

Materials Available. For information purposes the BSCS Company produces a *Newsletter* available free upon request, a Bulletin Series concerned with special aspects of biological education, a Special Publication Series dealing with teacher preparation, teacher training films, and an information film circulated upon request to those interested in the programs of the BSCS.

For a current listing of BSCS materials and their sources write to the project director. *BSCS International News Notes* provides information on BSCS materials that have been translated into foreign languages.

Further information is available from the project director.

(See also number 21.)

30. FOUR MOTION PICTURES IN SOCIAL BIOLOGY. 1971- . **L. Eugene Cronin** and **Edward J. Kormondy** (see address below), University of Maryland, College Park, Maryland 20742.

Current Contact. Edward J. Kormondy, Provost, The Evergreen State College, Olympia, Washington 98505.

Digest. This project is developing films which deal with the social and ethical implications of new knowledge developments in the life and social sciences. These films are intended for use primarily at the secondary school level.

Discussion. Led by a Technical Advisory Committee of biologists, social scientists, educators, and master teachers, the project directors are working in close collaboration with film producer Eric Cripps of Biofilms to produce four films entitled: *Technological Man: Death—An Invention of Life; Animal Worldview;* and *Man, the Symbol Maker.* The films, along with printed instructional guides, are intended for use in both science and social studies classes or may form the basis of a new course in social biology. It is expected that the films will have a variety of alternative uses with adult audiences—for continuing education, for public television, for informing the concerned citizen.

The films deal with questions on the social and ethical implications of new knowledge of the evolutionary process, of human heredity, of the molecular basis of the genetic apparatus, of comparative social behavior, of disease and fertility control in animal and human populations, of the physiological and genetic basis of human psychological processes, and of the interrelationship of the life and social processes.

Materials Available. Further information can be obtained by writing to Edward J. Kormondy at the address listed above.

31. ECOLOGICAL FILM PROJECT. 1970-1973. **John J. Lee** and **Martin Sacks,** Department of Biology, The City College of the University of New York, Convent Avenue at 138th Street, New York, N. Y. 10031.

Digest. *Green Marsh and Blue Waters,* a 17 min., 16 mm color film with sound, was produced with the intent to arouse the intellectual curiosity of secondary school students and provoke lively and informed classroom discussion on the conflicting demands of society and the needs of an important environmental resource, the marine salt marsh. The film discusses the role of marshes in the fertility of the sea; how pollution, landfill, and "development" affect the ecosystem; the price we pay for such disruption; and why an ecologically oriented plan for the future management of coastal marshes is imperative.

Materials Available. The film can be obtained from Time-Life Films, 53rd & 6th Avenue, New York, N. Y. 10024.

(See also number 32.)

32. LIVING BIOLOGY FILM SERIES. 1960-1971. **John J. Lee** and **Martin Sacks,** Department of Biology, The City College of the University of New York, N.Y. Convent Avenue at 138th Street, New York, N.Y. 10031. (Original grantee: Yeshiva University, 55 Fifth Avenue, New York, N. Y. 10003; former director, Roman Vishniac (deceased), 1960-1969.)

Digest. The project produced two series of 16 mm color films with sound, two single concept films, and thirteen film loops that explore the physiology, behavior, and interactions of plants and animals in their natural habitats at or near the water's edge in freshwater ponds and salt water.

Discussion. The films provide a candid investigation of microscopic algae and other life in the pond, and of inter-tidal zone life as these organisms occur in their natural environments to supplement the limited artificial atmosphere of the laboratory. The films enable the students to see the dynamic living processes upon which many current interpretations and biological theories draw for data and confirmation. The films in this series are: *The Standing Water, The World of Many Habitats, Life in the Pond, The Brim of Sand, The Rocky Shore, The Edge of the Sea,* and *Microscopic Algae.*

The single concept films (15 minutes each) are: *Aquatic Feeding Mechanisms,* which illustrates the diverse feeding mechanisms that have evolved among aquatic invertebrates; and *External Respiration,* which illustrates and contrasts the diversity of oxygen-extracting morphological structures in aquatic invertebrates.

Each film loop is a single concept segment that explains the life cycle, ecology, physiology and/or morphology of one of the animal groups that is discussed more generally in the longer films.

Materials Available. The films can be purchased or rented from McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, N.Y. 10020; or Universal Education and Visual Arts, 221 Park Avenue South, New York, N.Y. 10003.

(See also number 31.)

33. FILMS ON THE NATURE OF VIRUSES. 1959-1961. **Wendell M. Stanley,** Virus Laboratory, University of California, Berkeley, California 94720.

Digest. Various aspects of the study of viruses are taken up in eight 30-minute films produced to help acquaint high school and college students and teachers, and the general public, with the results of recent research in virology, and with the implications of such results for the understanding of certain fundamental problems in biology. The series has been used by schools, colleges, and educational television. The films, which are 16 mm, black-and-white, with sound, are: *Giant Molecules, The Stuff of Life, Viral Genes, Between the Living and the Non-living, How Viruses Kill, Threads of Life, Killers and Carcinogens,* and *Cancer.*

Materials Available. Rental or purchase of these films can be arranged through the Audio-Visual Center, Indiana University, Bloomington, Indiana 47401.

C. Chemistry

34. CHEMICAL EDUCATION MATERIAL STUDY (CHEM Study). 1959-1969. **George C. Pimentel,** Department of Chemistry, University of California, Berkeley, California 94720. (Original grantee: Ohio State University, Columbus, Ohio 43210. 1959-1960.)

Current Contact. David W. Ridgeway, Executive Director, CHEM Study, Lawrence Hall of Science, University of California, Berkeley, California 94720.

Digest. CHEM Study is a program of instruction that emphasizes the experimental approach to the study of chemistry at the secondary level and the critical importance of laboratory work. It is designed to be useful to the student who is college bound as well as to the student for whom it will be a terminal course.

Discussion. CHEM Study reflects the cooperative efforts of university scientists, industrial scientists, and experienced high school chemistry teachers. Emphasis is on principles, the understanding of which grows out of experiments; history and descriptive chemistry are de-emphasized. Major sections of the course are: An Introduction to Scientific Activity, Some Fundamental Concepts in Chemistry, A Macroscopic View of Chemical Reactions, A Microscopic View of Substances, and Descriptive Chemistry. There is a close integration of text, laboratory manual, and films. Films accomplish those things which could not be done as well in the classroom by students or teachers because of impracticality, danger, or expense. Some concepts are demonstrated effectively through the use of animation.

Basic course materials are supplemented by two self-instruction programs, two series of achievement tests, 26 basic films, 17 teacher training films, 13 film loops, a presentation film (*A Chance to Wonder Why*), an information film (*CHEM Study, Information for Educators*), and two monographs. Work continues on development of a bank of film loops based on the course films.

The written materials have been translated into fourteen languages and some or all of the films have been translated into seven languages.

Materials Available. The original materials available from W. H. Freeman & Co., 660 Market Street, San Francisco, California 94104 are:

The CHEM Study Story (a history of the project).

Chemistry—An Experimental Science (text, laboratory manual, teacher guide).

Study Achievement Examinations.

Programmed Instruction Pamphlets (*Exponential Notation, The Slide Rule* and *Achievement Tests*—two series, 1963-64 and 1964-65).

Additional materials are available from Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632:

Man-Made Transuranium Elements (G. T. Seaborg).

Why Do Chemical Reactions Occur? (J. A. Campbell).

CHEM Study films are distributed by Modern Learning Aids, P. O. Box 302, Rochester, N. Y. 14603 for sales, and by Modern Film Rentals, 2323 New Hyde Park Road, New Hyde Park, N. Y. 11040 for rentals.

35. CHEMICAL BOND APPROACH PROJECT (CBA). 1958-1968. **Laurence E. Strong,** Department of Chemistry, Earlham College, Richmond, Indiana 47374.

Digest. The CBA high school chemistry course was intended to be more experimental and less descriptive or authoritarian in character than traditional secondary school courses. The course emphasizes logical schemes which permit students to investigate and interpret a variety of chemical systems.

Discussion. The CBA text has five main sections: The Nature of Chemical Change; The Electrical Nature of Chemical Systems; Models as Aids to the Interpretation of Systems; Bonds in Chemical Systems; and Order, Disorder, and Change. Laboratory work closely related to the text progresses from the early experiments for which students are given rather complete directions to experiments late in the course for which students themselves provide much of the experimental design. A significant feature of the laboratory program is a scheme of vertical development wherein groups of experiments are designed to fit together in such a way as to aid students in acquiring both technical facility and interpretive skill in moving from simple to fairly complex investigations. A systematic attempt is made to help students distinguish between data produced by experiment and the imaginative ideas used to interpret data.

Materials Available. The original materials published by the Webster Division of McGraw-Hill Book Co., but now out of print are:

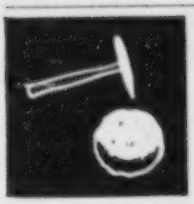
Chemical Systems (textbook) and a teacher guide.

Investigating Chemical Systems (student laboratory guide) and a teacher guide.

Examination sets.

Answer sheets for examinations.

Inquiries should be made to the project for any copies that may still be available. Meanwhile, Professor L. B. Clapp of the Department of Chemistry, Brown University, and six teachers who have taught the CBA program for a number of years have completed a revision. Inquiries about the availability of revised materials should be sent to Professor Clapp pending arrangement for commercial distribution.



D. Environmental Sciences

Meteorology

36. STUDY GUIDE ON PROBLEMS OF AIR POLLUTION. 1970-1972. **Robert G. Nurnberger,** State University of New York, Albany, N. Y. 12222.

Digest. A study guide on atmospheric pollution for use by secondary school teachers of science and social studies was prepared in an NSF-sponsored workshop in the summer of 1970. The guide, which was field tested and revised during the following academic year, has five sections: (1) a description of the atmosphere and of atmospheric processes; (2) societal aspects of air pollution; (3) activities of man contributing to pollution; (4) student-oriented activities for use in science, humanities, and social studies courses; and (5) a guide to the use of related literature.

Materials Available. The guide, entitled *Air Pollution Manual*, can be ordered from the project director.

(See also numbers 22 and 41, and page 25.)

37. MOTION PICTURES IN METEOROLOGY. 1960-1971. **Kenneth C. Spengler,** American Meteorological Society, 45 Beacon Street, Boston, Massachusetts 02108.

Digest. Ten 16 mm films on various aspects of the atmospheric sciences, together with related teacher guides, were prepared for use as supplementary teaching aids and resource materials for secondary school earth science courses and for introductory college courses in meteorology.

Discussion. The titles of the films, which are in color except as noted, are: *Above the Horizon, Formation of Raindrops, Solar Radiation I: Sun and Earth, Solar Radiation II: The Earth's Atmosphere, Sea Surface Meteorology* (black and white), *Planetary Circulation* (black & white), *Atmospheric Electricity, Convective Clouds, It's an Ill Wind,* and *Wind Chill.* Several film loops are concerned with condensation nuclei, nucleation of supercooled water drops, and cloud growth and development. A comprehensive summary article was published in the October 1971 issue of *Weatherwise.*

Materials Available. The films, loops, and teacher guides are available from Modern Learning Aids, P. O. Box 302, Rochester, New York 14603 or Universal Education and Visual Arts, 221 Park Avenue South, New York, N. Y. 10003.

(See also number 38.)

38. MONOGRAPH SERIES IN METEOROLOGY. 1960-1970. **Kenneth C. Spengler,** American Meteorological Society, 45 Beacon Street, Boston, Massachusetts 02108.

Digest. Eight popular monographs provide educational resource material in meteorology for science-oriented high school and beginning college students, and for the interested layman.

Discussion. Outstanding scientists have authored the "popular" monographs on physical processes, principles, and features of the atmosphere. Titles in the series are: *Weather on the Planets, Watching for the Wind, From Raindrops to Volcanoes, The Edge of Space, The Unclean Sky, Jet Streams, Weather and Health,* and *Harvesting the Clouds.* A summary article on the series appeared in the August 1969 issue of *Weatherwise.*

Materials Available. The eight titles, paperback and hardbound, were published by Doubleday & Company, Inc., Garden City, Long Island, N. Y. 11530, as part of their Anchor Science Study Series. They may be purchased from the publisher or from most larger bookstores.

(See also number 37.)

Oceanography

39. COLUMBIA-LAMONT MARINE SCIENCE FILMS. 1963-1968. **Maurice Ewing,** Lamont-Doherty Geological Observatory, Columbia University, Palisades, New York 10964.

Digest. The series of four 16 mm color films (with sound, 25-30 min. each) is designed to bring important advances in the study of the maritime portions of the earth into high school and college classrooms and thus into the mainstream of science education. Study guides accompany the films.

Discussion. Each of the films is focused on a principal investigator who narrates portions of the film. His working methods and problems are shown and described and the principal facts about his particular discipline are communicated.

History Layer by Layer (David B. Ericson, Lamont-Doherty Geological Observatory) shows the process of raising deep sea cores from the floor of the ocean and how laboratory examination of fossil remains in the core reveals climates of the past. The film is for use in earth science, general science or biology courses, along with units on earth history, climates of the past, and the Pleistocene era.

Adaptation to a Marine Environment (Malcolm Gordon, University of California, Los Angeles, California) filmed on location in Thailand, describes attempts to find out how an unusual frog native to the mud flats can live alternately in fresh and salt water. The film is intended for use in biology, health, physical science, or general science courses, to supplement units on osmosis, hydrostatic pressure, diffusion, blood plasma, absorption of food, and excretion of waste.

Waves Across the Pacific (Walter Munk, Institute of Geophysics and Planetary Physics, La Jolla, California) shows a study of deep ocean waves from their origin in storms off Antarctica to the breaking waves on an Alaskan beach. Energy spectra, wave amplitude, and wave length are recorded at island stations along the path of the wave train. The film may be used in physical science, general science or mathematics courses in connection with units on wave propagation.

The Earth Beneath the Sea (Maurice Ewing, Lamont-Doherty Geological Observatory) explains how geophysicists study the portion of the earth beneath the ocean waters. Samples are obtained by means of instruments attached to mile-long cables. Where samples cannot be obtained, recording instruments give clues to the nature of the material and the processes going on within it. The film is meant for use in earth science, general science, and physical science courses, to accompany units on earth history, geophysics, and oceanography.

Materials Available. Distributor of the films is McGraw-Hill Films, 1221 Avenue of the Americas, New York, New York 10020.

40. OCEANOGRAPHY—EIGHT NARRATED FILMSTRIPS. 1962-1966. **Richard C. Vetter,** Ocean Affairs Board, National Academy of Sciences—National Research Council, 2101 Constitution Ave., N. W., Washington, D.C. 20418.

Digest. *Oceanography—Understanding Our Deep Frontier,* a set of eight 35 mm filmstrips in color and with coordinated sound, each of which discusses some aspect of oceanographic studies, was produced for use in secondary school courses in biology, physics, chemistry, and the earth sciences. The filmstrips can be used either as a series or independently.

Discussion. The titles in the series are *Physical Oceanography, Chemical Oceanography, Geological Oceanography, Biological Oceanography, Ocean Engineering, Marine Resources, Air-Sea Interaction,* and *A Career in Oceanography.* The filmstrips average 70 frames in length, and are accompanied by a recorded 15-minute narration (four records containing two narrations each), four booklets containing the narration text, a glossary, a bibliography, and an annotated list of schools, colleges, and universities offering courses in oceanography.

Materials Available. The filmstrips (singly or by the set), records, and other materials can be obtained from Encyclopaedia Britannica Educational Corporation, 425 North Michigan Avenue, Chicago, Illinois 60611 or from Macalaster Scientific Corporation, Rt. 111 and Everett Turnpike, Nashua, N. H. 03060.

Environmental Experiments

41. ENVIRONMENTAL EXPERIMENTS PROGRAM (EEP). 1971-1973. **Courtland S. Randall,** Oak Ridge Associated Universities, Inc., P. O. Box 117, Oak Ridge, Tennessee 37830.

Digest. Four prototype packages including equipment and related teaching materials were developed for environmental studies at the secondary level.

Discussion. Each experiment package includes parts and a construction manual for building a monitoring instrument, and a field study guide. Packages were developed for studies in acquatic pH, atmospheric carbon monoxide, vehicular traffic noise, and background nuclear radiation. Experiments are designed to increase student awareness of the complexity of environmental problems and to stimulate interest in their solution through first hand experience in environmental monitoring and measurement.

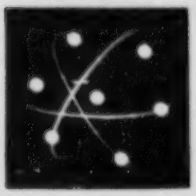
Materials Available. Further information may be obtained from the project director.

(See also numbers 22 and 36.)

Environmental Sciences—General

For additional projects that include materials with environmental implications, even though titles do not necessarily indicate that is the case, see also the following:

8. Minnesota School Mathematics and Science Teaching Project (MINNEMAST).
9. Conceptually Oriented Program in Elementary Science (COPES).
10. Elementary Science Study (ESS).
11. Science Curriculum Improvement Study (SCIS).
12. SCIENCE—A PROCESS APPROACH (SAPA).
20. Outdoor Biology Instructional Strategies (OBIS).
23. PROBING THE NATURAL WORLD—Intermediate Science Curriculum Study (ISCS).
27. INVESTIGATING THE EARTH—Earth Science Curriculum Project (ESCP).
29. HIGH SCHOOL BIOLOGY—BSCS GREEN VERSION.
30. Four Motion Pictures in Social Biology.
31. Ecological Film Project.
32. Living Biology Film Series.
37. Motion Pictures in Meteorology.
60. GEOGRAPHY IN AN URBAN AGE—High School Geography Project (HSGP).
64. THE MAN-MADE WORLD—Engineering Concepts Curriculum Project (TMMW).



E. Interdisciplinary

42. INDIVIDUALIZED SCIENCE INSTRUCTIONAL SYSTEM (ISIS). 1972- . **Ernest Burkman,** Florida State University, Tallahassee, Florida 32306. (Project headquarters: 415 N. Monroe Street, Tallahassee, Florida 32301.)

Digest. The ISIS project is developing a flexible, open-ended, interdisciplinary curriculum that will facilitate individualization of science instruction at the high school level.

Discussion. The Individualized Science Instructional System will consist of approximately 80 short, essentially independent modules, each requiring 2-3 weeks of classroom time. Each module will deal with a specific topic by presenting, in an interdisciplinary manner, the appropriate concepts from biology, chemistry, and physics. Pertinent information from the social sciences will be incorporated in units that deal with the social implications of science and technology. Mathematics will be included when necessary. For many of the modules, "excursions" will be developed which will permit the more able, college-bound student to probe into some of the more complex aspects of the topic. In an effort to keep down the equipment costs for schools adopting ISIS, the laboratory work will make use of materials and apparatus normally available in high school science labs. Guidance in implementing ISIS under a variety of situations will be provided by an instructional management scheme.

Short- and long-range goals of the project are: (1) elimination of the unnatural barriers between scientific disciplines in an effort to provide the student with a better understanding of science; (2) development of materials which will (a) motivate students and provide them with sufficient knowledge to be scientifically literate and (b) permit more capable students to select and attain more advanced instructional goals; (3) formulation of a model which, hopefully, will promote changes in other subject-matter disciplines and, eventually, in the structure of the secondary school system.

Materials Available. The ISIS Newsletter is available without charge from the project. Plans are being made for commercial distribution of the modules.

(See also number 23.)

43. PORTLAND INTERDISCIPLINARY SCIENCE PROJECT. 1969-1971. **Karl Dittmer,** College of Science, Portland State University, Portland, Oregon 97207.

Current Contact. Michael Fiasca, School of Education/TTT, Portland State University, P. O. Box 751, Portland Oregon 97207.

Digest. The Portland Project pioneered the development of the unified science concept by producing a 3-year integrated science course as an alternative to traditional high school biology, chemistry, and physics courses.

Discussion. By proceeding from a generally qualitative approach in the first year to a more formal and quantitative approach in the second and third years, this course draws a picture of science as a structure that begins with observation, develops into the formulation of general principles, and culminates with the application of those principles to more involved problems.

The first year of the integrated sequence may be considered both as preparatory for what is to come in successive years and as a terminal course for students at the ninth or tenth grade level. Year One is divided into four parts: *Perception and Quantification; Heat, Energy and Order; Mice and Men;* and *Environmental Balance.* A sound cross-disciplinary view of biology, chemistry, and physics with unifying themes is presented here. Year Two consists of two parts: *Motion and Energy* and *Chemical Reactions.* The main focus in Year Two is to lay the necessary background in chemical and physical phenomena so that students are equipped to proceed into the third year of the course where a substantial amount of biochemical and biophysical concepts is introduced. Year Three consists of four parts: *Waves and Particles, The Orbital Atom, Chemistry of Living Matter and Energy,* and *Capture and Growth.* The first thrust is to build the orbital model of the atom using as background waves, electromagnetism, and historical models of the atom. With shape, size, and energy relationships of molecules established, the DNA molecule is introduced. A culmination of this work comes in the final section where photosynthesis is considered. With this topic, much that has gone before is brought into logical focus.

Materials Available. The project office can supply additional information about the course and the nature and cost of course materials. Also available are (1) the *Portland Project Newsletter* and a collection of excerpts from the teacher guides, free of charge; and (2) 15 sets of achievement examinations and a listing of behavioral objectives for the course, sold at cost.

The course materials are distributed by the Duplicating Department, Portland State University, Portland, Oregon 97207.

(See also number 23.)

44. BIOMEDICAL INTERDISCIPLINARY CURRICULUM PROJECT (BICP). 1968-

Leonard A. Hughes, California Committee on Regional Medical Programs, Box 4445, Berkeley, California 94704.

Digest. The BICP is developing a curriculum for 11th and 12th grade students of average ability or above to motivate and prepare them for post-secondary education leading to careers in the medical and health fields. The science, mathematics, and communications/social studies elements of BICP are coordinated around medical and health related topics.

Discussion. The first year of this 2-year interdisciplinary instructional program focuses on the physical, biological, and psychological needs of the individual. In the second year students will draw on their first year's background to study health problems in the aggregate. Although the curriculum focuses on the interests and academic needs of high school students who may continue their education in medical and health fields, it also provides a broad base on which young people can build careers in other fields as well.

The BICP requires four classroom periods (or the equivalent in modular scheduling units) each day. Of these four, two are devoted to biomedical sciences and laboratory work, one to mathematics, and one to communications/social studies.

The topics selected from chemistry, physics, and biology to make up the science course are those closely related to the everyday problems of the individual and of society. Mathematical concepts and skills are also considered in the context of the solution of health problems. In the communications/social studies course the focus is on the analysis of social problems, especially as they concern health, and on the skills necessary for effective communication in the social sciences and humanities.

The analysis of social and environmental problems, the approach to economics and resource application, the uses of statistics, and the study of public health and epidemiology provide contacts with topics and ways of studying these topics at the secondary school level.

A multi-school trial of the program was initiated in September 1973 after an extended developmental period.

Materials Available. Inquiries about the availability of BICP materials and about participation in the tryout phases of the project should be sent to the project director. The project also circulates a newsletter upon request.

45. "HORIZONS OF SCIENCE" FILMS. 1959-1960.

John S. Hollister, Educational Testing Service, Princeton, New Jersey 08540.

Digest. The films in this series in effect allow an audience to take actual field trips with prominent scientists and to hear them describe their work and its importance. They cover a range of disciplines and their usefulness extends from kindergarten to adult audiences.

Discussion. The "Horizons of Science" film series consists of ten 16 mm color films with sound (average running time: 20 minutes) that were produced to communicate the excitement of science and provide students and other audiences with an understanding of the significance of a number of important research efforts. The films in the series and their contributing scientists are: *Visual Perception* (Henry Cantril, psychologist), *The Worlds of Dr. Vishniac* (Roman Vishniac, microbiologist), *Exploring the Edge of Space* (Otto C. Winzen, aeronautical engineer), *Thinking Machines* (Claude Shannon, Alex Bernstein, Leon Harmon), *The Mathematician and the River* (Eugene Isaacson, mathematician), *New Lives for Old* (Margaret Mead, anthropologist), *Project "Mohole"* (U. S. oceanographic expedition), *The Realm of the Galaxies* (Allan R. Sandage, astronomer), *The Flow of Life* (Benjamin Zweifach and others), and *Neutrons and the Heart of the Matter* (Donald J. Hughes). A study guide accompanies each film.

Materials Available. The films can be purchased, and a brochure giving details about the individual films is available, without charge, from the project. The films are not available for rental from ETS, but they have been purchased by many of the states that maintain film depositories, and wherever that is the case schools can make rental arrangements through the appropriate state procedures.

F. Mathematics, Computers

46. SCHOOL MATHEMATICS STUDY GROUP (SMSG). 1958-1972. **E. G. Begle,** School of Education, Stanford University, Stanford, California 94305. (Original grantee: Yale University, New Haven, Connecticut 06520. 1958-1961.)

Digest. The SMSG project produced a variety of materials including texts, tests, films, teacher guides, monographs, supplementary and/or enrichment materials, supplementary readings for students and teachers, and teacher training films. Some or all of these kinds of materials were produced for the senior high school level. For a full description of the project see number 76.

47. SOURCE BOOK ON APPLICATIONS OF MATHEMATICS. 1974- . **Alex Rosenberg,** Cornell University, Ithaca, New York 14850. (Grantee: Mathematical Association of America, 1225 Connecticut Avenue, N. W., Washington, D.C. 20036.)

Digest. The project will produce a source book for secondary school mathematics teachers on applications of mathematics. Applications from other academic disciplines as well as from everyday life will be considered. Particular emphasis will be put on model building in studying real world problems.

Discussion. The resulting source book will contain background material for the teacher, including various sorts of models, what is involved in constructing a model, the relation between models and the real world, and some completely worked out examples of model construction. This is a joint project with the National Council of Teachers of Mathematics (NCTM) and the Committee on the Undergraduate Program in Mathematics (CUPM).

Materials Available. Comments and evaluation by secondary school teachers will be the basis for revision of a preliminary version. Information about availability of a preliminary version and the final edition can be obtained by writing to the project director.

48. DEVELOPMENT OF COMPUTER SIMULATION MATERIALS (HUNTINGTON II). 1970- . **Ludwig Braun,** State University of New York, Stony Brook, New York 11790. (Prior grantee: Polytechnic Institute of Brooklyn, Brooklyn, New York 11201. 1970-1972.)

Digest. This project is producing computer-simulated experiments to support secondary school studies in biology, physics, and the social sciences.

Discussion. Selection of experiments to be simulated is based on (1) the value of exposing students to the principles involved and (2) the impracticality of having the students actually perform the experiment for reasons of safety or constraints of time or equipment.

The basic materials for each simulation include: (1) a paper-tape copy of the simulation program; (2) a student manual, which gives a brief background on the topic and information on using the simulation; and (3) a teacher manual, which describes briefly how to use the program, suggests preparatory activities, lists some questions that could be used to stimulate follow-up discussion, and provides sample runs to give the teacher an understanding of the way the simulation works. In addition, a resource manual for each simulation gives a detailed description of the model, including underlying assumptions and what happens when the assumptions are violated, an in-depth discussion of the theoretical background in the subject where appropriate, instructions for changing parameters or making program modifications, and an extensive bibliography in the subject area of the simulation to provide additional reading material for teacher or student use.

Materials Available. Simulation materials may be purchased from the Software Distribution Center, Digital Equipment Corporation, Maynard, Massachusetts 01754.

A filmstrip and cassette recording entitled *Simulation, An Educational Tool* explains the nature and rationale of simulation and cites experiences of some teachers who have used simulation in the classroom. This package may be obtained from the Digital Equipment Corporation or borrowed from the project director.

Information on simulation packages now available or in preparation may be obtained by writing to the project.

49. **UNIFIED MODERN MATHEMATICS: SECONDARY SCHOOL MATHEMATICS CURRICULUM IMPROVEMENT STUDY (SSMCIS). 1960- . Howard F. Fehr,** Teachers College, Columbia University, New York, N.Y. 10027.

Digest. The mathematics program that has been developed eliminates the customary separation of the field of mathematics into the several different branches of arithmetic, algebra, geometry, and analysis, and unifies instruction through fundamental concepts and structures. Materials for the 6-year secondary school program are now available to schools generally. This program is intended for high ability students.

Discussion. Although mathematicians have known for some years that formal mathematics can be organized in terms of fundamental concepts and structures, it has not been clear until recently whether or not mathematics instruction at the secondary school level could be organized effectively in that manner. The unified mathematics program designed by this project has demonstrated its feasibility for grades seven through twelve. The unification is brought about by constructing the curriculum around fundamental concepts (such as set, relation, mapping, operation) and basic structures (such as group, ring, field, vector space). The instructional efficiency of this construction permits introduction into high school of much mathematics usually reserved for the college undergraduate years. The unified organization, along with elimination of certain traditional topics no longer considered useful, permits teaching of the calculus, in the 5th and 6th years of the course, to all college-bound students. Probability and Statistics appear as chapters of instruction in each grade. A feature of the twelfth grade program is a set of booklets for individualized teacher-student instruction. Course materials were released for publication only after two revisions based on supervised tryouts. Courses 1, 2, and 3 were produced under a grant from the United States Office of Education.

Materials Available. Informational documents available without charge from the project office are:

Information Bulletin No. 6.
An SSMCIS Report: Mathematics Education in Europe and Japan.

Information Bulletin No. 7.
Secondary School Mathematics Curriculum Improvement Study.

Technical Report No. 4.
Performance of SSMCIS Students on the College Entrance Examination Board Level 2 Mathematics Test.

Technical Report No. 7.
Performance of SSMCIS Students on the Preliminary Scholastic Aptitude Test Level 2 Mathematics.

Technical Report No. 10.
Transferring in and out of the SSMCIS Program.

Other technical reports are available from the project office.

Textbooks and teacher commentaries are available from Teachers College Press, 1234 Amsterdam Avenue, New York, New York 10027. Supplementary booklets published by the Press are: *A. Introduction to Statistical Inference, B. Determinants, Matrices, and Eigenvalues, C. Algebra Structures, Extensions, and Homomorphisms, D. An Introduction to Differential Equations,* and *E. Geometric Mappings and Transformations.*

Textbooks and teacher commentaries for Courses 1, 2, and 3 are available from Addison-Wesley Publishing Company, Inc., Sand Hill Road, Menlo Park, California 94025.

50. DEMONSTRATION AND EXPERIMENTATION IN COMPUTER TRAINING AND USE IN SECONDARY SCHOOLS. 1967-1971. **Thomas E. Kurtz,** Kiewit Computation Center, Dartmouth College, Hanover, New Hampshire 03755.

Digest. This project identified and sought ways to overcome the major obstacles to effective computer utilization at the secondary level.

Discussion. The project was carried out in a number of New England high schools to which Dartmouth College provided computer service. Specific areas on which attention was focused were (1) the preparation and training of teachers in all relevant subjects and (2) the preparation of teacher-written curricular materials. Among the noteworthy outcomes were:

(a) Aviable computer-using community of secondary schools was established in New England. That the cost/benefit ratio is reasonable is demonstrated by the fact that these schools are now supporting the cost largely on their own.

(b) The large number of teachers successfully trained in 2- to 4-week short courses indicates that this "basic training" on the computer could require as little time as is ordinarily required by a university half course.

(c) Over 40 topic outlines were produced, providing evidence that teachers, with some support from a central institution, can develop parts of courses and prepare their own

materials. Many of these topic outlines are in current regular use at schools both in and out of the project group of schools. Eight of the best outlines are available in printed form as "course booklets."

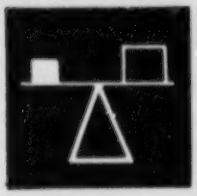
The question of how a university computer center branches out to become a regional computing center for secondary schools and colleges was also addressed by the project. Some comments on the question can be found in the reports listed below.

Materials Available. Available without charge from the Documents Center, Kiewit Computation Center, Dartmouth College, Hanover, New Hampshire 03755: Interim Report I (1968) and II (1969), and the Final Report (1970). Also available from the Center for a nominal charge are eight Course Booklets: *Computer Course for Business Students, Computer Use in a General Math Course, Data Reduction Experiments for Introductory Physical Science, School BASIC, BASIC in Ten Minutes a Day, Orbital Mechanics, Suggestions for Programs,* and *n Equations in n Unknowns.*

51. MODERN COORDINATE GEOMETRY. 1964-1967. **Robert A. Rosenbaum,** Wesleyan University, Middletown, Connecticut 06457.

Digest. *Modern Coordinate Geometry* was prepared as a textbook for a 10th grade mathematics course. It was based on an earlier experimental text of the same name developed by the School Mathematics Study Group. Coordinates are used in a natural way from the outset, yielding a body of knowledge unlike that of the traditional high school geometry course, but much like the kind of geometry actually used in scientific work. A distinctive feature of the text is the development of affine geometry before Euclidean. The text materials were tried out in 35 classes during the 1963-65 school year. That experience provided the background for a revision that was used on a trial basis the following year.

Materials Available. Commercial editions of *Modern Coordinate Geometry* and the *Teacher's Commentary and Solution Key* were published in 1969 and are available from Houghton Mifflin Company, 110 Tremont Street, Boston, Massachusetts 02107.



G. Physics, Physical Science

52. THE PROJECT PHYSICS COURSE (PPC). 1965-1969. **Gerald Holton,** Department of Physics; **Fletcher G. Watson** and **F. James Rutherford,** Graduate School of Education, Harvard University, Cambridge, Massachusetts 02138.

Current Contact. Professor Fletcher G. Watson, Harvard Physics Course, Graduate School of Education, Harvard University, Longfellow Hall, Appian Way, Cambridge, Massachusetts 02138.

Digest. From a small scale feasibility study beginning in 1962 and underwritten by a grant from the Carnegie Corporation, the work of the Harvard Project Physics group was enlarged into a national curriculum development program in 1964, supported by funds from the Carnegie Corporation, the Sloan Foundation, the Ford Foundation and the U.S. Office of Education. The project first received support from NSF in 1965. It has created a multi-media individualized course of instruction in physics that is aimed at a wide variety of students including those already intent on scientific careers, those who may not go on to college, and those who, in college, will concentrate on the humanities or the social sciences.

Discussion. The new course is centered on a solid introduction to physics, including some of its recent developments, but it has specific features to distinguish it from most existing physics courses. For example, as the occasion arises, passages in the text or assignments in a supplementary reader stress the humanistic background of the sciences—how modern physical ideas have developed, and the work of individuals who made key contributions; the effect physics has had on other sciences, especially chemistry and astronomy; the fact that progress in physics contributes to contemporary technology and in turn is stimulated by it; and the social consequences of scientific advance. Course materials consist of an articulated array of components including the text, supplemental units, laboratory

apparatus, films, film loops, programmed instruction, special readers, transparencies, examinations, and teacher guides. A detailed evaluation of the impact of the course on students was made.

Materials Available. Newsletters and other material describing the project, and a bibliography of published evaluations and research reports, are available from the project.

All components of the PPC (texts, films, apparatus, etc.), both in the school and in the college versions, are obtainable through Holt, Rinehart and Winston, Inc., 383 Madison Avenue, New York, New York 10017.

53. PHYSICAL SCIENCE STUDY COMMITTEE (PSSC). 1956-1968. **Uri Haber-Schaim,** Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160. (Original grantee: Massachusetts Institute of Technology, Cambridge, Massachusetts 02139. 1956-1959.)

Current Contact. Uri Haber-Schaim, Director of Physical Science Group, Department of Science and Mathematics Education, School of Education, Boston University, Boston, Massachusetts 02215.

Digest. By concentrating on fewer facts than are ordinarily included in beginning physics, the PSSC course is able to devote considerable time to the "story lines" running through physics which give insight into how the facts are tied together. The laboratory is considered as equal in importance to the text, class discussions, and films as a means of learning and teaching.

Discussion. A variety of teaching/learning materials has been developed by the Physical Science Study Committee to assist both teachers and students: a textbook, now in its third revised edition; a laboratory guide with many new, non-traditional experiments; a large number of films; low-cost equipment; an extensive library of paperbacks on science topics written for the course by distinguished authors; and teacher guides which provide background information and suggestions for class and laboratory activities. All of these are now available through commercial channels.

The textbook, *Physics*, first published in 1960 and revised in 1965, was revised in several significant ways for the third edition that came on the market in 1971. This latest edition reflects recent advances in secondary school science, especially at the junior high school level. For example, most of the original Part I (an introduction to the fundamental physical notions of time, space, and matter) was deleted. The remainder of the text was updated through subject-matter revisions and/or editorial changes.

Materials Available. The textbook (*Physics*, 3rd edition), laboratory guide, teacher resource book, and a set of achievement tests are published by D. C. Heath & Co., 125 Spring Street, Lexington, Massachusetts 02173. Apparatus kits are available from several supply companies. The films are rented and sold by Modern Learning Aids, 1212 Avenue of the Amgricas, New York, New York 10036.

(See also number 54.)

54. PHYSICAL SCIENCE STUDY COMMITTEE—ADVANCED TOPICS SUPPLEMENT. 1960-1969. **Uri Haber-Schaim,** Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160.

Current Contact. Uri Haber-Schaim, Director of Physical Science Group, Department of Science and Mathematics Education, School of Education, Boston University, Boston, Massachusetts 02215.

Digest. This supplement to PSSC physics was developed with these applications in mind: (1) The teacher can select topics to enrich or individualize the standard PSSC course. (2) The topics can be used in an advanced high school physics course. (3) They can be used as part of an introductory college physics course.

Materials Available. The text book (*Advanced Topics Supplement*, 3rd edition, 1972) incorporates a laboratory guide. The text as well as a teacher resource book and a set of achievement tests are published by D.C. Heath & Co., 125 Spring Street, Lexington, Massachusetts 02173. Apparatus for use with topics in the *Supplement* is available from a number of supply companies. Films can be obtained from Modern Learning Aids, 1212 Avenue of the Americas, New York, New York 10036.

(See also number 53.)

H. Social Sciences

55. SECONDARY SCHOOL CURRICULUM PROJECT ON HUMAN BEHAVIOR. 1974- . **John K. Bare,** Department of Psychology, Carleton College, Northfield, Minnesota 55057. (Grantee: American Psychological Association, 1200 Seventeenth Street, N.W., Washington, D.C. 20036.)

Digest. Current grant support provides for the first stage of a project that will develop curriculum modules on the topic of human behavior, for use at grades 10 to 12.

Discussion. Each module will be of two to three weeks duration and will emphasize a scientific approach to the study of behavior. Three themes will be common to all modules: (1) human behavior can be systematically observed, (2) it exhibits enough regularity to make possible the derivation of general statements, and (3) principles of human behavior can be derived by empirical means. Activities to be completed during the first year include a statement of the conceptual framework of the modules; guidelines for module topics; statements of criteria for evaluating the project, the modules, and prospectuses for module design; and some prospectuses approved and design teams formed for the first group of modules.

Materials Available. Inquiries about materials or other aspects of the project should be directed to the project director.

56. HIGH SCHOOL POLITICAL SCIENCE CURRICULUM PROJECT. 1972- . **Howard D. Mehlinger,** Social Studies Development Center, Indiana University, 1129 Atwater, Bloomington, Indiana 47491. (Grantee: American Political Science Association, 1527 New Hampshire Avenue, N.W., Washington, D.C. 20036.)

Digest. New instructional materials are being developed to create an alternative approach to twelfth-grade American government courses, focusing on a comparative analysis of politics and featuring the use of the high school itself as a laboratory for testing propositions about politics.

Discussion. Materials produced will be conceptually oriented, interdisciplinary in content, and treat perennial problems and universal experiences in the life of mankind. Basic phenomena such as system change and maintenance, conflict, leadership, and decision making will be considered. The materials will be designed to be used either in conjunction with existing curricula or as new programs in political science education. During the 1973-74 school year prototype units are being tested in schools with a wide range of political and demographic characteristics.

Materials Available. Further information is available from the project director.

(See also number 14.)

57. EXPLORING HUMAN NATURE (EHN). 1970- . **Irven DeVore, Peter B. Dow,** and **George Goethals,** Education Development Center, Inc., 15 Mifflin Place, Cambridge, Massachusetts 02138. (Grantee: Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160.)

Current Contact. Anita Gil, EDC, Cambridge.

Digest. *Exploring Human Nature* is a year-long interdisciplinary course for senior high school students and is organized around four aspects of the human condition: the biological roots of behavior, the cultural context of our behavior, physical maturation and the transition to adulthood, and competent functioning within a social structure.

Discussion. The course leads students to the frontiers in the behavioral sciences by exploring a series of questions that enlighten our understanding of the human species.

Units of the course are: I.—The Origins of Human Behavior, II.—Childhood and the Community, III.—Coming of Age: Managing Transition, and IV.—Individuals in Society: Competition and Cooperation.

Students begin by exploring key variables in the life styles of other species. Utilizing the fossil record, the methods and insights of primate behavior studies, comparative anatomy, and the ecological exigencies of an ancient, hunting way of life, they reconstruct man's own past. Using extensive data from other societies and the students' own cultural world, students investigate the development of personality differences, considering the ways in which environ-

ment influences the social system of a people, and focusing on the period of early socialization.

The course then turns to conceptions of what is involved in the age of transition from childhood to adulthood—biologically, socially, and psychologically. Through ethnography, first-person accounts, literature, and theoretical writings from the biological and social sciences, the unit describes and analyzes the ways by which young people in our own and other societies are prepared for entry into the adult world, and what this transition means in individual lives. Following this section students turn to the question of how men and animals are organized in social groups. Using such organizing concepts as status, role, and dominance, the course explores the means whereby power is generated, channeled, and perpetuated in social groups. Finally, the course considers the perplexing question of human aggression. What are its biological roots, its cultural manifestations?

Materials Available. Materials for the course, which will include films, descriptive and ethnographic booklets, posters, games, records, and teacher manuals, are being field tested in the 1973-74 school year. Further information can be obtained by writing to the project director.

(See also numbers 15 and 21.)

58. PRIMATE BEHAVIOR UNIT. 1967-1971. **Sherwood L. Washburn** and **Phyllis Dohlinow**, Department of Anthropology, University of California, Berkeley, California 94720.

Digest. This project developed a unit on the behavior of nonhuman primates for use as background or enrichment material in high school social studies courses. The unit has been tried out in a private school, a public school, and a remedial program. It has been revised and plans are being made for commercial publication.

Discussion. The primate unit is intended to convey an understanding of behavior as an adaptive phenomenon. It can provide a perspective for viewing the relationships between biology and the social sciences and between experimental and descriptive science. Field experience with the unit indicates that it can stimulate discussion of human behavior on a significantly lower emotional level than tends to be the case when human behavior patterns are considered alone.

Two types of discussion make up the text. The animal-oriented chapters describe the daily lives of several nonhuman primates, e.g., Baboons and Patas Monkeys, Langurs and Rhesus Monkeys. The other type of discussion consists of such topics as mother-infant relations, play, and aggression. Related films and other supportive materials are suggested.

The setting and purposes for which the unit is to be used will determine the length of time to be devoted to it; in trials some classes worked with it for only two weeks and in others for as long as two months.

Materials Available. The unit is available in photocopy form from the project director until such time as it becomes commercially available.

59. SOCIOLOGICAL RESOURCES FOR THE SOCIAL STUDIES (SRSS). 1964-1972. **Robert C. Angell**, 503 First National Building, Ann Arbor, Michigan 48108. (Grantee: American Sociological Association, 1722 N Street, N.W., Washington, D.C. 20036.)

Current Contact. Otto Larsen, Executive Officer, American Sociological Association.

Digest. SRSS developed three kinds of materials for use with senior high school students: (1) thirty short units called "episodes" which are suitable for use in a wide variety of senior high school social studies courses, (2) a one-semester course entitled *Inquiries in Sociology*, and (3) a series of seven paperback books, each consisting of readings on a sociological topic.

Discussion. The objective of SRSS was to present substantive sociological content of high quality and to emphasize the process of inquiry. The episodes on such topics as "Social Mobility in the United States," "Small Group Processes," "Roles of Modern Women," and "Images of People" can be used in English courses and the humanities as well as in social studies courses. The paperback collections of readings on sociological topics, e.g., *Racial and Ethnic Relations*, *Cities and City Life*, and *Delinquents and Criminals: Their Social World*, provide a broad spectrum of resource materials. *Inquiries in Sociology* includes four major topics: socialization, institutions, social stratification, and social change.

A volume entitled *Experiences in Inquiry* uses materials from the published work of the High School Geography Project and Sociological Resources for the Social Studies. This book is intended for use in social studies methods classes and in in-service training programs.

A teacher training film, *Sociological Investigation in the Social Studies Class*, shows a class working on an episode.

Materials Available. The 30 episodes, the paperbacks, *Inquiries in Sociology*, and *Experiences in Inquiry* are available from Allyn and Bacon, Inc., 470 Atlantic Avenue, Boston, Massachusetts 02210. The film is

available for rental or purchase from the Audio-Visual Education Center, University of Michigan, 416 S. Fourth Street, Ann Arbor, Michigan 42103.

Six additional episodes are available from Educational Programs Improvement Corporation, University of Colorado, Box 390, Boulder, Colorado 80302.

(See also number 60.)

60. **GEOGRAPHY IN AN URBAN AGE:** HIGH SCHOOL GEOGRAPHY PROJECT (HSGP). 1964-1972. **Dana Kurfman,** P. O. Box 1095, 2985 East Aurora, Boulder, Colorado 80302. (Grantee: Association of American Geographers, 1710 16th Street, N.W., Washington, D.C. 20009.)

Current Contact. Salvatore Natoli, Educational Affairs Director, Association of American Geographers.

Digest. The purpose of this project was to improve the quality of geography teaching in high schools. A one year geography course adaptable to students in grades 9 to 12 was developed. Six units comprise the course, entitled *Geography in an Urban Age.*

Discussion. The units that make up *Geography in an Urban Age* provide content and activities for a full-year's course at the high school level. Units are printed separately so materials can be selected to suit the needs of individual schools.

Unit titles are: I. Geography of Cities; II. Manufacturing and Agriculture; III. Cultural Geography; IV. Political Geography; V. Habitat and Resources; and VI. Japan. The organizing theme of the course is human settlement. Activities emphasize inquiry, small group work, interpretation of data, role-playing, decision-making, and other forms of student involvement. The course was designed with the average student in mind, but optional activities are available for advanced students, and low achievers have handled many aspects of the course successfully.

A number of teacher-training instruments were prepared. Among them is *Experiences in Inquiry* which uses materials from Sociological Resources for the Social Studies as well as from the High School Geography Project. The book is intended for use in social studies methods classes and in in-service training programs.

Materials Available. Available from The Macmillan Company, School Division, 866 Third Avenue, New York, New York 10022: *Geography in an Urban Age: The Local Community: A Handbook for Teachers* (aids and activities for teaching about a local area); a sample kit of materials and activities from the course (no charge); *High School Geography: New Insights,* a film for teachers.

Available from Association of American Geographers: *Activities Selected from the High School Geography Project* (eight activities that were not included in the final version of the course); *From Geographic Discipline to the Inquiring Student* (final project report).

Available from Allyn and Bacon, Inc., 470 Atlantic Avenue, Boston Massachusetts 02210: *Experiences in Inquiry.*

(See also number 59.)

61. ANTHROPOLOGY CASE MATERIALS PROJECT (ACMP): TECHNOLOGY AND SOCIETY. 1969- . **Robert G. Hanvey,** 914 Atwater, Indiana University, Bloomington, Indiana 47401.

Digest. Instructional materials for high school students and in-service seminars for teachers have been developed on the topic of "Technology and Society." The unit is distributed in unfinished form and the "starter kit" includes readings, tapes, films, and filmstrips which can be assembled in many different combinations. Through such combinations and by adding elements, teachers can create their own units, tuned to various courses and student capabilities.

Discussion. The seminar materials—directed to teachers—consist partly of papers and audio-tapes prepared by various specialists. These specialists represent many disciplines: history, law, geography, computer science, sociology, and anthropology. Participants in the ten-session seminar thus encounter a sampling of perspectives on technology/society phenomena. The ideas treated in the papers and tapes articulate loosely with the instructional material for students.

The ten seminar sessions are self-conducted by small groups of teachers, meeting in their own schools. Teachers who participate can explore the topic for its possible contributions to the social studies curriculum and for experimenting with classroom use of instructional materials related to the topic.

The idea for an in-school seminar originates in the observation that (1) teachers seldom discuss substantive ideas in depth with other teachers and (2) local curriculum development is seldom based on intensive consideration by teachers of current thinking on a given subject. The assumption on which the development of these materials is based is that many teachers are "grounded" intellectuals. This is to say that they are stimulated by new ideas, that they honor objectivity and precision in the handling of ideas, that they desire a role in creating instructional programs that incorporate significant ideas, but that they are frustrated by occupational expectations that do not call for or reinforce these professional qualities.

Materials Available. A pilot version of the materials is available at cost. Further information is available from the project director.

(See also number 64.)

62. **PATTERNS IN HUMAN HISTORY:** ANTHROPOLOGY CURRICULUM STUDY PROJECT. (ACSP). 1962-1972. **Malcolm Collier,** 5632 Kimbark Avenue, Chicago, Illinois 60637. (Grantee: American Anthropological Association, 1703 New Hampshire Avenue, N. W., Washington, D.C. 20009.)

Current Contact. Edward Lehman, American Anthropological Association.

Digest. *Patterns in Human History* was developed in response to expressions of interest in the potential contribution of anthropology to high school education. The course is designed for use within the first semester of a world history course, or as a separate high school anthropology program.

Discussion. The materials were developed to reach the largest number of students rather than only advanced students or elective courses. Student materials include readings, sound filmstrips, casts of stone tools and figurines, overhead transparencies, and evidence cards. The first part, "Studying Societies," is basic. The three parts that follow—"Origins of Humanness," "The Emergence of Complex Societies," and "Modernization and Traditional Societies"—build on understandings and skills learned in the first part. The course teaches about observation and analysis of social data, about culture as a concept and as man's form of adaptation, about objectivity and ethnocentrism, about technology, and about the bio-cultural history of man.

Materials Available. *Patterns in Human History* is available from The Macmillan Company, 866 Third Avenue, New York, New York 10022.

Related materials also available from Macmillan: *The Great Tree and the Longhouse: Culture of the Iroquois* and a teacher manual by Hazel W. Hertzberg; *Kiowa Years: Study in Culture Impact* and *The Kiowas: Profile of a People* by Alice Marriott and a teacher manual by Rachael Reese Sady; and *An Annotated Bibliography of Anthropological Materials for High School Use* by James J. Gallagher.

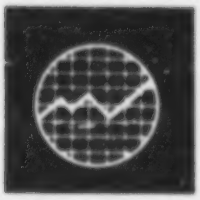
63. SPADEWORK FOR HISTORY, A FILM SERIES ON ARCHAEOLOGICAL RESEARCH. 1961-1964. **E. Mott Davis,** Department of Anthropology, University of Texas, Austin, Texas 78712.

Digest. This series of six films shows archaeological research in the United States as it actually takes place.

Discussion. The films show research work as scholarship, as practical engineering, as management in the field and laboratory, and, in general, as one of the many human activities basic to modern civilization. Their essential purpose is to challenge the student who might undertake scientific work as a career—the student who is both intellectually oriented and practical-minded.

Reservoir salvage archaeology is the focus of these films, providing a forceful example of the close relationship between scientific research and non-scientific considerations. The titles of the films are: *Salvaging American Pre-history, The Desert, The Woodlands, Plateau and Pacific, The Plains,* and *Salvaging Texas Prehistory.* The first film tells the story of the country as a whole. Each of the others gives a brief review of prehistory of one part of the United States and goes on to tell how archaeologists work in that part of the country. The six films may be viewed independently, but are more effective when viewed in sequence.

Materials Available. The films can be rented from the Film Booking Office, Visual Instruction Bureau, Division of Extension, University of Texas, Austin, Texas 78712. They can be purchased from Radio/Television, University of Texas.



I. Technology

64. **THE MAN-MADE WORLD** (TMMW): ENGINEERING CONCEPTS CURRICULUM PROJECT (ECCP). 1964- . **John G. Truxal,** State University of New York, Stony Brook, N. Y. 11790. (Prior grantees: Commission on Engineering Education, Washington, D. C. 20036. 1964-1967; Polytechnic Institute of Brooklyn, Brooklyn, N. Y. 11201. 1967-1972.)

Digest. The ECCP has developed an interdisciplinary course that is intended to enhance the technological literacy of upper-level high school students who do not plan careers in science or engineering. Accordingly, the course, *The Man-Made World* (TMMW), does not place primary emphasis on the scientific method, and the process of logical thinking is given preference over mathematical problem-solving ability.

Discussion. TMMW stresses the interactions between man and machine and between society and technology. The approach used in this study has three basic components: (1) Decision Making, Modeling, Optimization, and the use of Simulation, in order to better understand problems and final solutions to them. (2) Logic and Computers, concerning the extension of man's mental abilities through logic circuits and computers, as well as the processing of information. (3) Dynamic Systems, dealing with stability, feedback, and amplification concepts as used in controlling systems. These systems might be the human body and social systems, as well as mechanical or electrical systems.

For students having less ability or motivation, a modified version of the course is available. *Technology-People-Environment: An Activities Approach to TMMW* consists of an introductory unit and eight minicourses comprising a total of 121 activities, most of which require only a single class session. This structure makes the course especially adaptable to students whose attendance patterns are irregular.

Materials Available. Basic course materials are available from the Webster Division of the McGraw-Hill Book Co., 1221 Avenue of the Americas, New York, N. Y. 10020. Among the materials are: (1) *The Man-Made World*, a student text that incorporates a laboratory guide; and (2) teacher aids such as a *Teacher's Manual*, masters for making overhead transparencies, tape cassettes, and a package of tests covering the entire student text. (While there have been no films developed by the project, the *Teacher's Manual* contains notes on many appropriate films that are available commercially.)

Laboratory equipment for TMMW may be ordered from AMF Electrical Products Development Division, 1025 North Royal Street, Alexandria, Va. 22314.

A sound filmstrip about the course may be borrowed or purchased from the project. Requests for the free *ECCP Newsletter* and other information about the courses should also be directed to project headquarters.

(See also number 61.)

IV. RELATED PRE-COLLEGE PROJECTS

A. Coordination, Studies and Research

65. STANFORD MATHEMATICS EDUCATION STUDY GROUP. 1974- . **E. G. Begle**, Stanford University, Stanford, California 94305. (Grantee: Mathematical Association of America, 1225 Connecticut Avenue, N. W., Washington, D.C. 20036.)

Digest. Three instructional variables important in elementary mathematics are undergoing investigation. Findings are expected to be valuable in efforts to increase mathematics learning effectiveness in the classroom.

Discussion. During academic year 1973-74 the project investigated the extent to which a listing and review of prerequisite concepts, skills, and principles is provided; the extent to which nonexamples of the concept are included in student materials; and the number of practice items provided following the exposition of a skill, concept, or principle. The general procedure for each variable was preparation of two programmed versions of an appropriate mathematics topic that differed only in that one version had a high value of the variable under investigation while the other version had a low value. Investigations dealt at the fifth grade level with factors and primes and at the eighth grade level with probability. The programmed units for both levels were derived from programs developed in 1971 and 1972 by the School Mathematics Study Group (SMSG) Research and Analysis staff to illustrate the canonical teaching procedures outlined in the final report of the SMSG Panel on Tests. Both of the original programs have been written in such a way that each of the instructional variables identified by the Panel on Tests was clearly evident and independent of other variables, thus each variable could be manipulated without affecting the others.

Materials Available. Inquiries about materials that will result from the study should be addressed to the project director.

(See also number 76.)

66. A SUMMER WORKING STUDY—MATHEMATICS CURRICULUM. 1973. **Jerrold R. Zacharias**, *Education Development Center, Inc., 55 Chapel* Street, Newton, Massachusetts 02160.

Digest. The working conference conducted a feasibility study for a new program in mathematics drawing upon science, technology, and the arts, and using television and manipulable materials.

Discussion. The aim of the proposed program is to teach mathematical topics to children—especially minority children—ranging in age from 8 to 11. The plan is to use mathematical techniques in realistic problems and situations. The television programs would have high entertainment value and would use a

mixture of styles and techniques, including children on-screen, skits, and animation.

Materials Available. A conference report on the summer working study is available from the project director.

67. AN ANALYSIS OF OPERATIONAL SCHOOL MATHEMATICS CURRICULA. 1971- . **Robert B. Davis,** Curriculum Laboratory, University of Illinois, 1210 West Springfield Avenue, Urbana, Illinois 61801, and **Herbert Ginsburg** (Rand Hall, Cornell University, Ithaca, N. Y. 14850). (Prior grantee: Syracuse University, Syracuse, N. Y. 13210. 1971-1973.)

Digest. Two parallel questions are undergoing investigation with particular reference to elementary school students: (1) What mathematics do schools attempt to teach children? and (2) What do students actually learn? Answers to these questions will lead to a consideration of what changes in mathematics education are desirable.

Discussion. Answers to the first question are being obtained by studying course guides, textbooks, CAI materials, etc., and by direct observation of actual classroom activities. What elementary school students actually learn is being determined by observation of individual students—at CAI terminals, in other school settings, and through "clinical" interviews. Early (and tentative) results suggest sizable discrepancies between what children actually learn and what present curricula seek to teach.

Materials Available. Relevant publications: Robert B. Davis and Rhonda Greenstein, "Jennifer," *New York State Mathematics Teachers Journal* XIX (3), 94-103 (June 1969); Robert B. Davis, "The Problems of Relating Mathematics to the Possibilities and Needs of Schools and Children," *Educational Studies in Mathematics* (Holland: D. Reidel Publishing Co., 1971); Herbert Ginsburg, "Children's Knowledge and Individualized Instruction," *Educational Technology* XII (3), 8-12 (March 1973); _____, *The Myth of the Deprived Child* (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1972); *Journal of Children's Mathematical Behavior*, Vol. 1, Nos. 1 and 2 published by the Madison Mathematics Project, 1210 West Springfield Avenue, Urbana, Illinois 61801.

(See also number 4.)

68. EVALUATION OF PROJECT SEED. 1971-1973. **Donald R. Kerr, Jr.,** Department of Mathematics, Indiana University, Bloomington, Indiana 47401.

Digest. SEED (Special Elementary Education for the Disadvantaged) is a program in which disadvantaged elementary school children are taught abstract mathematics using a guided discovery method. The project measured the impact of SEED on the self concept of children in Gary, Indiana. Results suggest a positive impact on arithmetic self concept and on attitude toward mathematics, but do not provide a clear picture concerning generalized self concept. An attempt was also made to determine the impact of the experience on the classroom teachers and on the SEED teachers.

Discussion. SEED consists of several projects throughout the country that were initiated by William F. Johntz of Berkeley, California. The goals of SEED are to improve achievement in mathematics and the self concept of disadvantaged children. The evaluation project attempted to test success in improving self concepts of children in SEED classes located in several inner city schools in Gary, Indiana, between 1970 and 1972. All of the schools had student bodies largely composed of black students. SEED instruction was given to each class for 45 minutes four times each week by a trained mathematician with the classroom teacher present.

Three generalized self concept scales were used on a pre-test, post-test basis during the 1971-72 school year. They were used again in the 1972-73 school year as followup after no additional SEED experience. Results of the evaluations are described in the report of the project.

Materials Available. Copies of the report on the SEED Evaluation Project can be obtained by writing to Donald R. Kerr, Jr., Assistant Director, Mathematics Education Development Center, 329 S. Highland Avenue, Bloomington, Indiana 47401.

69. MATHEMATICAL PROBLEM SOLVING. 1971- . **Joseph M. Scandura,** Graduate School of Education, University of Pennsylvania, Philadelphia, Pa. 19104.

Digest. The project is investigating the question of why certain students who have all the appropriate component skills are successful in solving problems, while other students who have the same skills are not successful. The research deals specifically with the relation of so-called "lower order" rules to "higher order" rules.

Discussion. In this research an assumption has been made that ability to solve a problem can be traced largely to a person's command or lack of command of "higher order" rules which make it possible to combine component skills ("lower order" rules) to generate a solution.

Two experimental studies have been completed: one involved a "higher order" composition rule, the other a "higher order" generalization rule. The results of these two investigations showed that when given the "lower order" rules relevant to an unfamiliar problem *and* a "higher order" rule for combining them the subjects participating in the research almost invariably solved the problem. Subjects without training on the "higher order" rule uniformly failed. These results support the following generalizations: (a) if a rule is available for achieving a given goal, the subject will use it; (b) if not, control automatically shifts to the higher order goal of deriving such a rule; (c) once that higher order goal has been satisfied (rule has been derived) control reverts to the next lower goal (i.e., the original goal).

Subjects were also tested on their ability to handle the higher order task of generating procedures for solving the problems. When these results were used to predict actual skill in solving the problems, overall correct predictions were made approximately 85 percent of the time.

The "higher order rules" notion is also being used as a basis for identifying competencies that underly more complex kinds of mathematical problem solving. An analysis of studies in this field involving ruler-and-compass construction in plane geometry has been completed. Similar studies are underway in which algebraic proofs provide the subject-matter base. Also underway is the testing of a number of empirical rules for heuristics to improve problem solving.

Materials Available. Details about the research and information about published reports of its findings may be obtained by writing to the project director.

70. A LONGITUDINAL, COMPARATIVE STUDY OF THE EFFECTS AND IMPACTS OF **MAN: A COURSE OF STUDY.** 1974- . **Stephen B. Plumer** and **H. Russell Cort, Jr.**, Antioch College, 2139 Wisconsin Avenue, N. W., Washington, D.C. 20007. (Grantee: Antioch College, Yellow Springs, Ohio 45387.)

Current Contact. H. Russell Cort, Jr., Division of Developing Programs, Antioch College, 2139 Wisconsin Avenue, N. W., Washington, D.C. 20007.

Digest. The project will study the impacts of *Man: A Course of Study* (MACOS), an upper elementary interdisciplinary social studies curriculum. Three major questions will be addressed, as follows: What do students of MACOS learn? What do they retain? Is what MACOS students learn different from what non-MACOS students learn?

Discussion. The study will be descriptive, and is intended to detect a variety of learning outcomes through quantitative measures and qualitative evidence. Pre- and post-tests will be administered to students in MACOS and non-MACOS classes, some classroom observations will be conducted; and follow-up interviews will be conducted with a sample of students from the base line classes in the spring a year after the MACOS course has been completed.

Materials Available. A final project report will deal with findings of the study. Inquiries should be directed to the project.

(See also numbers 15 and 78.)

71. A STUDY OF PHYSICS TEACHING. 1970-1974. **J. W. Ivany,** American Institute of Physics, 335 East 45th Street, New York, New York 10017.

Digest. During the 1971-72 school year, this project conducted an in-depth survey of actual teaching practices in physics courses in 42 high schools in the Northeastern United States.

Discussion. This project had two main thrusts: (1) to develop reliable instruments for measuring parameters relevant to pedagogical style and quality of physics teaching and (2) to demonstrate the feasibility of using the instruments to provide an in-depth picture of physics teaching as practiced in selected United States secondary schools.

As stated in the project's final report (see Materials Available), "the description of physics teaching undertaken here focuses on three dimensions: the teacher and his pedagogical strategies; the teaching learning environment; and the student and his higher order understanding and appreciation of physics." The report contains copies of the survey instruments developed by the project and data and discussion of the results of administering these instruments in 42 high schools in the Northeastern United States. While the results are significant in themselves, a potentially more significant outcome of this particular survey should be in providing a data base against which the impact of future curricular developments can be reliably measured.

Materials Available. The final report of the project, "High School Physics Teaching: A Report on Current Practices," publication R-253, may be obtained from the Information Pool, Education Division, American Institute of Physics, P. O. Box 617, Stony Brook, New York 11710.

72. SEMINAR ON THE DIFFUSION OF NEW INSTRUCTIONAL MATERIALS AND PRACTICES. 1972- . **Lee Anderson, James Becker, Merrill Hartshorn,** and **W. Williams Stevens, Jr.**, Social Science Education Consortium, Inc., 855 Broadway, Boulder, Colorado 80302.

Digest. Participants in the seminar on the diffusion of new social science instructional materials and practices included practitioners involved in the diffusion of new ideas and scholars who study the diffusion process.

Discussion. Prior to the seminar, papers were prepared by some of the participants in the form of written responses to a set of questions relating to major variables and factors in diffusing innovations in education. At the conference responses were analyzed and discussed. Two summary publications are being prepared and will be based on the pre-conference papers and on conference proceedings. One publication will be geared to the knowledge needs of the creators of diffusion policies and the designers of diffusion programs. The other publication will be a handbook oriented to the knowledge needs of individuals responsible for carrying out diffusion activities. The two publications will be printed both as a single monograph and under separate covers.

Materials Available. Further information is available from the Social Science Education Consortium.

73. SOCIAL SCIENCE EDUCATION CONSORTIUM (SSEC). 1967- **Irving Morrissett,** Social Science Education Consortium, Inc., 855 Broadway, Boulder, Colorado 80302.

Digest. The Social Science Education Consortium has as its major purposes: (1) encouraging social scientists and educators to engage in the exchange of information and ideas, with the aim of encouraging development to increase the quality and quantity of curriculum materials for elementary and secondary schools; (2) facilitating communication between and among the various federally and privately funded curriculum projects and the school communities they are intended to serve.

Discussion. These two principal objectives of the Consortium are pursued with the active support of about 100 Consortium members—about half social scientists and half educators—through a variety of workshops, conferences, and clinics held throughout the country; by sponsorship of the ERIC Clearinghouse for Social Studies/Social Science at the Consortium offices in Boulder; and through the publication of reports and analyses of problems, activities, and innovations in social science education.

More specifically, Consortium activities include: (a) retrieving and cataloging social science literature and innovative curriculum materials; (b) inventorying and describing current curricular programs and resource materials in a regularly-revised *Data Book*; (c) maintaining a comprehensive "hands on" resource center with new social science/social studies project materials, innovative textbooks, games, simulations, and a professional library; (d) developing and implementing a curriculum materials analysis system; (e) determining rationales for selection of social science instructional materials; (f) training in-service teachers and teacher associates; (g) working with school systems in the selection and use of new social science curricula; (h) structuring the social sciences for curriculum development; (i) investigating relationships between learning theory and social science learning; and (j) publishing newsletters which report new trends and activities in social science education.

Materials Available. Publications include position papers, conference reports, research analyses, curriculum materials analyses, and books on various topics in the social sciences. A price list of publications and copies of the SSEC Newsletter are available on request. Further information may be obtained from the project director.

74. CAMBRIDGE CONFERENCE ON SCHOOL MATHEMATICS (CCSM). 1963-1971. **William T. Martin,** Education Development Center, Inc. (EDC), 55 Chapel Street, Newton, Massachusetts 02160.

Current Contact. John Joanou.

Digest. The Cambridge Conference on School Mathematics was an association of prominent mathematicians who came together originally because of a shared concern about the quality of mathematics education in elementary and secondary schools, and with the preparation of teachers of mathematics. Three major conferences were held between 1963 and 1967. For each conference a report was published.

Discussion. A group of 25 mathematicians and users of mathematics met in 1963 to explore long range curriculum reform needs in mathematics. The report of that conference, which was published under the title *Goals for School Mathematics*, provided guidelines for further curriculum-related activities.

The CCSM decided at the outset that it should not concern itself principally with preparation of materials for classroom use, but should leave that to others. However, it was felt that some materials should be developed and tested to demonstrate the feasibility of the goals that had been proposed. A total of 46 feasibility studies were conducted; of these, 19 are available.

A second major CCSM conference was held in 1966 to consider problems in the training of mathematics teachers; most elementary school teachers were unable to cope with the changes being made in mathematics curricula. The outcomes of that

conference were reported in *Goals for Mathematical Education of Elementary School Teachers.*

A third conference in 1967 was the result of a growing concern over the gulf between school mathematics and school science. The recommendations from this conference appear in *Goals for the Correlation of Elementary Science and Mathematics.* One outgrowth of this conference was initiation of the Unified Science and Mathematics for Elementary Schools (USMES) curriculum project, which is described in number 6.

Materials Available. The conference reports are available from Houghton Mifflin Co., 2 Park Street, Boston, Massachusetts 02107:

Goals for School Mathematics (1963).

Goals for Mathematical Education of Elementary School Teachers (1967).

Goals for the Correlation of Elementary Science and Mathematics (1969).

The 19 published feasibility studies are available from the ERIC Center for Mathematics and Science Education, 1800 Cannon Drive, 400 Lincoln Tower, Columbus, Ohio 43210.

(See also number 6.)

75. AAAS COMMISSION ON SCIENCE EDUCATION (CSE). 1962- . **John R. Mayor,** American Association for the Advancement of Science, 1515 Massachusetts Avenue, N. W., Washington, D.C. 20005.

Digest. The AAAS Commission on Science Education was established by the Board of Directors of AAAS to provide leadership and guidance for AAAS programs in science education in kindergarten through the undergraduate years, including teacher education. The attention of the Commission is currently focused on two areas: (1) Exemplary Instructional Materials, and (2) Communication and Information.

Discussion. Instructional materials in modern form is the focus for Exemplary Instructional Materials. Activities will center around development of standards and guidelines for production of modules, identification of existing modules and dissemination of information about them, and a cooperative module preparation effort with the Montgomery County (Maryland) School System.

Communication and Information encompass such activities as a publication program responsible for publishing an annual *Newsletter* that reports past and proposed activities of the Commission; six issues per year of *Science Education News*, some devoted to a single theme developed with invited contributions and others containing short reports of current interest on science education activities; *Science for Society: A Bibliography*, published annually; and the *International Clearinghouse Report*, published every even year, describing science and mathematics curriculum developments in this country and abroad. Other activities include a series of seminars and symposia for school superintendents that update them in the general area of science, a series of symposia for students, a series of symposia for guidance counselors, and symposia on a somewhat irregular basis for presentations in science education at annual meetings of the Association.

The Commission also sustains the Consortium of Regional Environmental Education Councils to provide for exchange of information and access to environmental information.

Materials Available. The following materials are available from the AAAS Commission on Science Education, 1515 Massachusetts Avenue, N. W., Washington, D.C. 20005:

1. *Science Process Instrument*, an experimental longitudinal student assessment instrument. Available for experimental use ($5.50 per copy).

2. *Science for Society—A Bibliography* ($1.00 per copy or 75 cents each for 10 or more copies).

3. Names are added to the mailing lists of the following publications without charge:

   Newsletter of the Commission on Science Education.

   Science Education News.

4. *Supplementary Science Reading for Children.* Bibliography of readings for grades 2 to 9.

5. *Guidelines and Standards for the Education of Secondary School Teachers of Science and Mathematics.*

6. *Preservice Science Education of Elementary School Teachers.*

The following is available from the Science Teaching Center, University of Maryland, College Park, Maryland 20742:

Report of the International Clearinghouse on Science and Mathematics Curricular Developments at $2.00 per copy.

(See also number 12.)

76. SCHOOL MATHEMATICS STUDY GROUP (SMSG). 1958-1972. **E. G. Begle,** School of Education, Stanford University, Stanford, California 94305. (Original grantee: Yale University, New Haven, Connecticut 06520. 1958-1961.)

Digest. The primary purpose of the SMSG was to foster research and development in the teaching of school mathematics. The project produced materials in mathematics for students and teachers in the elementary and secondary schools.

Discussion. Major objectives of the study group were preparation of sample text materials designed to illustrate the kind of curriculum that the members of the group felt was demanded by the increased use of science, technology, and mathematics in our society, and the preparation of materials designed to help teachers prepare themselves to teach such a curriculum. A second major activity was the contribution of the National Longitudinal Study of Mathematical Abilities in which students originally in grades 4, 7, and 10 were followed for five years to determine the effects of conventional, SMSG, and other new course sequences on performance in mathematics and science. This activity was extended to grades K-3, for which special tests measuring mathematics achievement were developed to evaluate higher cognitive skills usually ignored by standard tests. While the main thrust was the investigation of mathematics achievement in terms of curricular materials, the study was also concerned with such variables as socio-economic status, and the timing and placement of exposures to mathematical concepts.

SMSG also carried out some experimentation with specialized materials designed to fulfill specific needs in mathematics education. Available materials include:

1. Elementary School Texts—The elementary school materials are designed for use in self-contained classrooms and are suitable for average students as well as for those of higher ability. For each of the grades 1 through 6, there is a student text and a teacher commentary; for kindergarten, there is only a teacher book.

2. Junior High School Texts—These texts review and extend the mathematics of the elementary school in such a way as to provide a sound intuitive foundation for high school courses. A considerable amount of informal geometry is included. Each text is accompanied by an extensive teacher commentary.

3. Texts for Slower Students—These texts include the bulk of the mathematics for grades 7-9 listed in the series above and below, but with the level of reading difficulty reduced. It is expected that students will proceed through these materials at a slower rate. Each text is accompanied by an extensive teacher commentary.

4. High School Texts—These texts are designed for average and above-average students in a college preparatory program.

5. Supplementary Materials—A variety of booklets is available. Their common characteristic is that each requires less than a full academic year. In addition to the revised version of *Mathematics Through Science*, the unit *Mathematics and Living Things* is available in preliminary form. It is designed for use at the eighth-grade level and uses biological experiments to motivate mathematical ideas.

6. Supplementary and Enrichment Series—Most of these pamphlets are designed to allow teachers to try short modern treatments of particular mathematics topics in class. Student texts and teacher commentaries are available for most of the topics, though some pamphlets are designed for independent study or enrichment.

7. New Mathematical Library—This consists of a series of short expository monographs on various mathematical subjects. Objectives of the series are dissemination of good mathematics in the form of elementary topics not usually covered in the school curriculum, awakening of interest among gifted students, and presentation of mathematics as a meaningful human activity.

8. Studies in Mathematics—The books in this series are intended for teachers. Some provide background for a specific student course, and others are more general in nature.

9. Filmed Course for Elementary School Teachers—This course consists of 30 half-hour color films. The series is intended primarily to provide in-service elementary school teachers with a foundation in mathematics for any of the newer elementary school mathematics programs. *Brief Course in Mathematics for Elementary School Teachers* from the series *Studies in Mathematics* is designed to accompany the filmed course. The first 16 of the films provide a suitable background in mathematics for teachers of grades K-3. The remainder, building on these, is concerned with mathematics normally taught in grades 4-6.

10. Secondary School Mathematics—This is the second round of development of text materials suitable for all students at the junior high school level. The content is organized into 14 booklets of 2 chapters each and 14 teacher commentary booklets.

11. *ELMA Technical Reports* contain tests and other measuring instruments used in the National Longitudinal Study of Mathematical Abilities. Certain

findings of the study appear in two volumes titled *A Longitudinal Study of Mathematical Achievement in the Primary School Years: Description of Design, Sample, and Factor Analyses of Tests* and *A Longitudinal Study of Mathematical Achievement in the Primary School Years: Curriculum and Socio-Economic Comparisons and Predictions from Previous Achievement.*

In addition to the above, the study group has (1) arranged for translation of some publications into Spanish, (2) prepared programmed learning materials in various areas, and (3) prepared numerous reports and supplementary publications.

Materials Available. For information about the activities of the SMSG, a list of publications and films, or to receive the SMSG *Newsletter*, write to the project director. All the published materials are available from A. C. Vroman, Inc., 2085 E. Foothill Boulevard, Pasadena, California 91109.

(See also number 65.

B. Conferences

77. CONFERENCE ON PIAGET-TYPE RESEARCH. 1970-1971. **Myron F. Rosskopf (deceased),** Teachers College, Columbia University, New York, New York 10027.

Digest. The Conference brought together 40 mathematics educators and 15 developmental psychologists interested in pursuing Piagetian research in mathematics education.

Discussion. The one-week program consisted of two basic series of lectures. Hermine Sinclaire of the University of Geneva, Switzerland, presented a comprehensive overview of Piaget's cognitive development theory relevant to research by mathematics educators. Kenneth Lovell of the University of Leeds, England, considered recent Piagetian research relevant to the school mathematics program as well as further needed research. Daily colloquia were addressed by outstanding Piagetians and small seminars enabled participants to discuss research projects and interpretations of existing research.

Materials Available. *Piagetian Cognitive-Development Research and Mathematical Education*, a report of the Conference, can be obtained from the National Council of Teachers of Mathematics, 1906 Association Drive, Reston, Virginia 22091.

78. **MAN: A COURSE OF STUDY** CONFERENCES. 1974- . **Peter B. Dow,** Education Development Center, Inc., 15 Mifflin Place, Cambridge, Massachusetts 02138. (Grantee: Education Development Center, Inc., 55 Chapel Street, Newton, Massachusetts 02160.)

Digest. Two conferences will involve urban educators in the problems of introducing an innovative curriculum into the economic and cultural environment of inner city schools. The conferences are expected to serve as models for exploring barriers to implementation.

Materials Available. Inquiries about the conferences should be directed to the project director.

(See also numbers 15 and 70.)

79. CONFERENCE ON THE MIDDLE SCHOOL MATHEMATICS CURRICULUM. 1973. **Earl M. L. Beard,** Department of Mathematics, University of Maine, Orono, Maine 04473.

Digest. This national conference, one of three held during the summer of 1973 to consider ways of improving school mathematics, focused on grades six through eight.

Materials Available. A report of the conference is available from the project director. This report is also available through the ERIC Document Reproduction Service, P. O. Box O, Bethesda, Maryland 20014.

(See also numbers 80 and 81.)

80. CONFERENCE ON JUNIOR HIGH SCHOOL MATHEMATICS. 1973. **Uri Haber-Schaim,** Physical Science Group, Newton College of the Sacred Heart, Newton, Massachusetts 02159.

Current Contact. Uri Haber-Schaim, Director of Physical Science Group, Department of Science and Mathematics Education, School of Education, Boston University, Boston, Massachusetts 02215.

Digest. The conference was one of three national conferences held during the summer of 1973 to consider ways of improving school mathematics. The focus was on grades seven and eight.

Materials Available. A report of the conference is available from the project director. It is also available through the ERIC Document Reproduction Service, P. O. Box O, Bethesda, Maryland 20014.

(See also numbers 79 and 81.)

81. CONFERENCE ON THE K-12 MATHEMATICS CURRICULUM. 1973. **George Springer,** Mathematics Education Development Center, Indiana University, Bloomington, Indiana 47401.

Digest. This conference, held at Snowmass, Colorado, was one of three national conferences held during the summer of 1973 to consider ways of improving pre-college mathematics.

Discussion. Mathematicians, educators, and scientists identified current problems, discussed their causes, and proposed actions for improvement. Topics ranged from basic research in problem solving to public concern about incompetence in whole number arithmetic. Application of mathematics in solving real world problems was a central topic.

Materials Available. A report of the conference is available from the project director. It is also available through ERIC Document Reproduction Service, P. O. Box O, Bethesda, Maryland 20014.

(See also numbers 79 and 83.)

82. A NATIONAL CONFERENCE TO CONSIDER THE ROLE IN HIGH SCHOOL OF INTERDISCIPLINARY LEARNING THROUGH INVESTIGATION AND ACTION ON REAL PROBLEMS. 1972-1974. **Earle L. Lomon,** Education Development Center, Inc. (EDC), 55 Chapel Street, Newton, Massachusetts 02160.

Digest. A working conference met January 2-14, 1973, to examine the feasibility of reforming the high school instructional program to include opportunities for students to work with real problems. The recommendations formulated by the conference are presented in a published report.

Discussion. The work of the conference was based on the premises that (1) opportunities for active social roles are essential for adolescents to develop into socially repsonsible, competent adults and (2) young people would be better prepared for an effective role in an increasingly complex society by a more direct, real-problem-based approach to instruction than that provided by traditional high school courses or by the curriculum reforms introduced in the 1960's. In considering a high school curriculum in which result-oriented investigation of real problems by students would play a major role, the conference addressed itself to six tasks: (1) formulation and clarification of this kind of approach at the secondary level; (2) planning for "bridges" to other learning modes and to studies of specific disciplines; (3) consideration of strategies necessary and suitable to work within and improve the organizational structure of the secondary school in order to include interdisciplinary studies; (4) finding an acceptable solution to the problem of equitable allocation of resources (time, space, staff) among disciplines within the interdisciplinary programs; (5) examination of undergraduate and graduate teacher education experiences that can orient and prepare prospective and practicing teachers for this approach; and (6) discussion of potential issues in the evaluation of this approach.

Conference participants were drawn from the staffs of recent mathematics, science, and social science curriculum projects; current interdisciplinary and action-oriented curriculum development projects; teacher education programs; and from the ranks of skilled teachers and supervisors. Other participants were prominent scholars in specific disciplines, as well as those developing interdisciplinary approaches at the university level.

Materials Available. Limited quantities of an abridged report are available from EDC. The full conference report is scheduled to be published early in 1974 by Houghton Mifflin Company, 2 Park Street, Boston, Massachusetts 02107.

83. CONFERENCE ON TEACHERS' CENTERS IN MATHEMATICS EDUCATION. 1973. **Thomas C. O'Brien,** Southern Illinois University, Edwardsville, Illinois 62025.

Digest. The purpose of the conference scheduled for April 8-10, 1974 is to provide a forum for discussions on practical and theoretical issues with respect to teachers' centers in mathematics education.

Discussion. Two teachers' centers in the St. Louis metropolitan area are oriented to the needs of elementary school teachers and focused on the development of cognitive operations by children. Other variants of teachers' centers have been established in other areas of the country. There is a need to assess the conditions for success and to consider alternative models for teachers' centers concerned with mathematics education. An informal network for communication among leaders and potential leaders of teachers' centers will be encouraged.

Materials Available. A report of the proceedings of the conference will be available from the project director.

C. Other

84. THE ADAPTATION OF PROGRAMMED TUTORING TO MATHEMATICS (Programmed Math Tutorial—PMT). 1971- . **Phillip L. Harris,** Department of Psychology, Indiana University, Bloomington, Indiana 47401.

Digest. Programmed tutoring techniques originally developed for the teaching of beginning reading are adapted to the teaching of mathematics in the lower elementary school grades. The goal is to increase achievement in mathematics among primary school children.

Discussion. Programmed tutoring—a procedure which provides students with teaching assistants on a one-to-one, individualized basis and uses many of the principles of programmed instruction—has been used successfully for a number of years in the teaching of beginning reading.

In PMT the activities of a tutor are closely controlled by two programs: the *operational* programs specify in detail how the teaching is to be done, while *content* programs determine what is to be taught and the sequence in which topics are to be taken up. (PMT is not tied to any one basal mathematics textbook series.) The programs are such that the need for professional judgment on the part of the tutor is kept to a minimum. For this reason, persons with a limited knowledge of mathematics can perform successfully as tutors.

Expanded pilot testing of first grade materials began in 1971-72, and seven school systems participated in 1972-73. The participating group was substantially expanded for the 1973-74 school year.

Materials Available. Until such time as the materials become commercially available, a packet of sample PMT materials may be obtained without cost from the project office at Indiana University. The packet contains a detailed description of the PMT program, samples of tutoring instruments, and a number of research reports. School systems interested in implementing the PMT materials may obtain further information from the project director.

85. THE MATHEMATICS AIDS PROGRAM. 1967-1971. **Alvin N. Feldzamen,** Encyclopaedia Britannica Educational Corporation, 425 North Michigan Avenue, Chicago, Illinois 60611. (Grantee: Educational Broadcasting Corporation, 304 W. 58th Street, New York, New York 10019.)

Current Contact. Duane G. Straub, Director of Programming, Public Television Library, 512 E. 17th Street, Bloomington, Indiana 47401.

Digest. Two pilot programs in mathematics were produced for teachers, parents, and others interested in the "new math." The videotape programs, each 30 minutes in length, cover most of the major concepts of the new elementary mathematics curricula.

Materials Available. The two videotape programs, *New World, New Math,* and *New World, More New Math,* are available from the Public Television Library, 512 East 17th Street, Bloomington, Indiana 47401.

86. CENTER FOR UNIFIED SCIENCE EDUCATION (FUSE). 1972- . **Victor Showalter,** Federation for Unified Science Education, Box 3138, University Station, Columbus, Ohio 43210.

Digest. The principal functions of the FUSE Center are (1) to contribute to the development and dissemination of the concept of unified science programs and (2) to assist individual schools and school systems in planning and implementing their own unified science courses.

Discussion. The Center is concerned with science curricula from kindergarten through the first two years of college, and maintains an interest in schools abroad as well as those in the United States. In its formative years, however, the Center is giving particular attention to grades 7-12. The Center does not endorse any particular set of science materials or any given course design. Rather, it encourages and assists schools in synthesizing science curricula that will be especially appropriate to their own students and local conditions.

Center activities include: (1) establishing a comprehensive bank of unified science instructional and related literature that may be used either at the Center or by correspondence; (2) maintaining a directory of unified science programs now in operation or in the developmental stage; (3) maintaining a response system to facilitate rapid access to information in the Center's files; (4) conducting an annual series of workshops to help school personnel become familiar with unified science ideas and practices; (5) designing procedures and materials for use in remote workshops conducted entirely by local school staff members.

Materials Available. Available without charge is the quarterly newsletter, *Prism II*, which reports on the Center's activities and resources, and describes existing unified science courses.

The Center provides a list of modules that are available for local workshop use. These modules can be borrowed from the Center without charge for one week; the borrower pays shipping costs. Abstracts of unified science programs, student instructional materials, and research related to unified science education are available from the Center at nominal cost.

87. VIDEO TAPE PROJECT. 1968-1973. **Helen D. Berwald,** Department of Education, Carleton College, Northfield, Minnesota 55057. (Original grantee: The Associated Colleges of the Midwest, 60 West Walton St., Chicago, Ill. 60610.)

Digest. The project prepared more than 300 video tapes for use in pre-service and in-service teacher education courses. They were made under natural, ongoing classroom conditions, range over the major subject fields, and were drawn from all grade levels and many different types of schools and communities.

Discussion. To show the classroom as it is, every effort was made to record unrehearsed, spontaneous classroom activity in as natural a setting as possible. No special lighting or props were used, and cameras and microphones were operated from a van parked outside the school. Teachers were urged to make no special preparation for the taping sessions.

The tape series covers elementary and secondary school classes, representing the range of grades from kindergarten through senior high school in urban, suburban, and inner city schools. Academic areas represented are: English, modern foreign languages, science, mathematics, social studies, and, at the college level, foundations of education and general methods.

Two categories of tapes were made. Some consist of longer sequences from classrooms of a particular grade level or classrooms using materials of a particular curriculum project. Tapes in the other group present shorter sequences from several grade levels or curriculum projects, and focus on specific topics such as the use of discussion groups or inquiry strategies.

They may be used for a variety of purposes, and printed supplementary materials suggest possible uses. A video guide designates the location of particular activities on the tape, thus encouraging their use as "teach along" devices rather than as materials to be viewed from beginning to end without interruption.

Materials Available. Copies of the tapes are available for purposes of teacher education only. A $20 dubbing charge is made for each tape. Since copies are made for the purchaser's specific equipment, and because the dubbing charge is minimal, tapes are not available for previewing. Postage costs and the cost of blank tape when purchased through the project are additional. A catalog and other information about the tapes can be obtained from the project director.

PROJECT ABBREVIATIONS—GRANTEE INSTITUTIONS—PROJECT NUMBERS

ACMP	Anthropology Case Materials Project (Indiana)	61
ACSP	*Patterns in Human History:* Anthropology Curriculum Study Project (American Anthropological Association)	62
BICP	Biomedical Interdisciplinary Curriculum Project (California Committee on Regional Medical Programs)	44
BSCS	Biological Sciences Curriculum Study (University of Colorado)	29
CBA	Chemical Bond Approach Project (Earlham)	35
CCSM	Cambridge Conference on School Mathematics (Education Development Center, Incorporated)	74
CHEM Study	Chemical Education Material Study (University of California, Berkeley)	34
COPES	Conceptually Oriented Program in Elementary Science (New York University)	9
CSE	Commission on Science Education (American Association for the Advancement of Science)	75
ECCP	See MMW	34
EEP	Environmental Experiments Program (Oak Ridge Associated Universities, Incorporated)	41
EHN	Exploring Human Nature (Education Development Center, Incorporated)	57
ES	Environmental Studies for Urban Youth (The Evergreen State College)	22
ESCP	*Investigating the Earth:* Earth Science Curriculum Project (American Geological Institute)	27
ESS	Elementary Science Study (Education Development Center, Incorporated)	10
ESSP	Elementary School Science Project (University of Illinois)	13
FUSE	FUSE Center for Unified Science Education (Federation for Unified Science Education)	
HSGP	*Geography in an Urban Age:* High School Geography Project (Association of American Geographers)	60
HSP	Human Sciences Program (Biological Sciences Curriculum Study Company)	21
HUNTINGTON II	Development of Computer Simulation Materials (SUNY at Stony Brook)	48
IPS	*Introductory Physical Science* (Education Development Center, Incorporated)	24
ISCS	*Probing the Natural World:* Intermediate Science Curriculum Study (Florida State)	23
ISIS	Individualized Science Instructional System (Florida State)	42
MACOS	*Man: A Course of Study:* Social Studies Curriculum Program (Education Development Center, Incorporated)	15
MAD-M	Madison Mathematics Project (University of Illinois)	4

MINNEMAST	Minnesota School Mathematics and Science Teaching Project (University of Minnesota)	8
OBIS	Outdoor Biology Instructional Strategies (University of California, Berkeley)	20
PMT	The Adaptation of Programmed Tutoring to Mathematics (Programmed Math Tutorial) (Indiana)	84
PPC	Project Physics Course (Harvard)	52
PS II	*Physical Science II* (Newton College of the Sacred Heart)	25
PSSC	Physical Science Study Committee (Education Development Center, Incorporated)	53
SAPA	*Science—A Process Approach:* Commission on Science Education (American Association for the Advancement of Science)	12
SCIS	Science Curriculum Improvement Study (University of California, Berkeley)	11
SMSG	School Mathematics Study Group (Stanford)	76
SRSS	Sociological Resources for the Social Studies (American Sociological Association)	59
SSEC	Social Science Education Consortium (Social Science Education Consortium)	73
SSMCIS	*Unified Modern Mathematics:* Secondary School Mathematics Curriculum Improvement Study (Teachers College, Columbia)	49
TMMW	*The Man-Made World:* Engineering Concepts Curriculum Project (ECCP) (SUNY at Stony Brook)	64
TSM	*Time, Space, and Matter:* Secondary School Science Project (SSSP) (Rutgers)	26
UICSM	University of Illinois Committee on School Mathematics (University of Illinois)	17
USMES	Unified Science and Mathematics for Elementary Schools (Education Development Center, Incorporated)	6

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